Randi on Vaccinations | Miracle Tableau | UFO 'Disclosure' | FTC Tackles Homeopathy


# Skeptical Inquirer

THE MAGAZINE FOR SCIENCE AND REASON

Vol. 41 No. 2 | March/April 2017


# THE SELFISH GENE REVISITED

## RICHARD DAWKINS

**WHY SKEPTICISM?**
Ronald A. Lindsay

**WHY WE BELIEVE —LONG AFTER WE SHOULDN'T**
Carol Tavris and Elliot Aronson

**GOD'S OWN MEDICINE**
Paul A. Offit

**SHOULDN'T SKEPTICS KNOW WHAT THEY'RE TALKING ABOUT?**
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The Skeptical Inquirer (ISSN 0194-6730) is published bimonthly by the Center for Inquiry in association with the Committee for Skeptical Inquiry, P.O. Box 703, Amherst, NY 14226. Printed in U.S.A. Periodicals postage paid at Buffalo, NY, and at additional mailing offices. Subscription prices: one year (six issues), $35; two years, $60; three years, $84; single issue, $5.99. Canadian and foreign orders: Payment in U.S. funds drawn on a U.S. bank must accompany orders; please add US$10 per year for shipping. Canadian and foreign customers are encouraged to use Visa or MasterCard.

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Subscriptions and changes of address should be addressed to: Skeptical Inquirer, P.O. Box 703, Amherst, NY 14226-0703. Or call toll-free 1-800-634-1610 (outside the U.S. call 716-636-1425). Old address as well as new are necessary for change of subscriber's address, with six weeks advance notice. Skeptical Inquirer subscribers may not speak on behalf of CSI or the Skeptical Inquirer.

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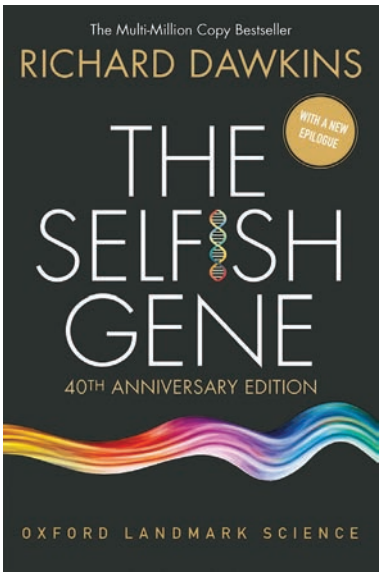

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"... promotes scientific inquiry, critical investigation, and the use of reason in examining controversial and extraordinary claims."

## [ FROM THE EDITOR

# CSICon in Limelight, *The Selfish Gene* Revisited

In this space last time I promised coverage in this issue of our CSICon 2016 Las Vegas conference. And here it is. We have an extended conference section. In addition, the feature articles by Ron Lindsay ("Why Skepticism?"), Carol Tavris ("Why We Believe—Long After We Shouldn't"), and Paul A. Offit ("God's Own Medicine") are derived from their talks at CSICon. And so is my conversation with our beloved colleague James Randi. Because this conference proved so successful, CSI has announced we'll have a CSICon 2017, again in Las Vegas, October 26–29.

In our cover article, our colleague the famed evolutionary biologist and author Richard Dawkins revisits the book that launched him into international prominence, *The Selfish Gene*. *The Selfish Gene* was first published in 1976, coincidentally the same year our organization CSICOP (now the Committee for Skeptical Inquiry) was established. The book supplied, for the first time to wide popular audiences, a clear view of evolution from the vantage point of the gene itself. It has sold millions of copies, including a second edition in 1989 and a thirtieth anniversary edition in 2006.

Now there is a fortieth anniversary edition, two in fact. Oxford University Press has published a trade paperback Fortieth Anniversary Edition of *The Selfish Gene* plus a hardcover titled *The Extended Selfish Gene*, which includes all the material in the former. It also includes two chapters from his second book, *The Extended Phenotype*, that responded to two main criticisms of *The Selfish Gene*—"the Great Genetic Determinism Fallacy," which Dawkins describes as the "mistaken view that our behavior is entirely determined by our genes," without regard to the environment and other factors; and second, the "adaptationist misunderstanding" that *all* features and behaviors should be understood as adaptations.

For these 2016 editions, Dawkins has written a new epilogue, and that is what we present in this issue. Some criticisms came from misunderstanding the book's title. In his article, Dawkins writes that equally appropriate titles would have been *The Cooperative Gene* or *The Immortal Gene,* and he explains why.

"The gene's eye view of life, the central theme of this book, illuminates not just the evolution of altruism and selfishness," Dawkins writes. "It also illuminates the deep past, in ways of which I had no inkling when I first wrote *The Selfish Gene*."

Dawkins has been a fellow of CSICOP/CSI since 1994. He, Carl Sagan, Francis Crick, and Glenn T. Seaborg wrote the four lead articles in our first magazine-sized, bimonthly format issue (January/February 1995).

Now he is even more closely associated with us. In early 2016, we announced that his Richard Dawkins Foundation for Reason & Science was merging with our overall organization, the Center for Inquiry. That merger is now complete and announced in this issue. CFI now includes as discrete entities our Committee for Skeptical Inquiry (and Skeptical Inquirer), the Council for Secular Humanism (and *Free Inquiry*), and the Richard Dawkins Foundation and its evolution-education activities. The merger adds breadth, strength, and resiliency to the organization.

CSI and Skeptical Inquirer—and our crucial mission of promoting scientific thinking, critical inquiry, and the use of science and reason in examining controversial or extraordinary claims—remain unchanged and treasured.

—Kendrick Frazier

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## Center for Inquiry and Richard Dawkins Foundation Now Formally Merged

*The following announcement was issued by the Center for Inquiry on December 31, 2016:*

At the beginning of 2016, the Center for Inquiry (CFI) and the Richard Dawkins Foundation for Reason & Science (RDFRS) began a partnership combining the people, programs, and resources of these two extraordinary organizations to better advance our shared mission for reason, science, and secularism. Throughout the year, CFI and RDFRS have worked with passion and purpose to combat religion's incursions into government, to expose pseudoscientific boondoggles, to support global freedom of expression, and to foster strong communities for secularists, skeptics, humanists, and other nonbelievers.

All this while, behind the scenes the final pieces were being set into place to formalize this partnership, a complicated process that took significant time and effort.

Today we are proud to tell you that on December 31, the Center for Inquiry and the Richard Dawkins Foundation for Reason & Science will officially—and legally—become one single institution.

As we announced back in January 2016, the Richard Dawkins Foundation for Reason & Science will now become a division of the new Center for Inquiry, as active as ever, bringing in such programs as Openly Secular and the Teachers Institute for Evolutionary Science (TIES).

CFI brings its foundational programs, the Committee for Skeptical Inquiry and the Council for Secular Humanism, along with the Office of Public Policy, CFI On Campus, African Americans for Humanism, and its vast network of local branches.

"This is a wonderful way to end an eventful and tumultuous year," said Robyn Blumner, who took on the role of CEO of CFI in January 2016 and will now also become president of the organization. "In 2017, there will be determined assaults on the secular character of our government, and the foundational role of science and facts in public policy will be challenged in new and dangerous ways. But now there's a stronger Center for Inquiry ready to meet those challenges head on."

Former CEO Ronald A. Lindsay, who until now retained the title of president during this transition, will to our delight remain a senior research fellow with CFI. Richard Dawkins will join CFI's Board of Directors, along with RDFRS board members David Cowan and Andy Thomson.

"I am deeply gratified that the Center for Inquiry has now formally merged with the Richard Dawkins Foundation for Reason & Science," said Eddie Tabash, Chair of the CFI Board of Directors. "We must continue the struggle for the full equality of atheists and other religious dissenters. We must continue to fight to preserve the scientific/empirical method in the crafting of public policy. No one should ever lose their legally available freedoms because of nothing more than the religious beliefs of someone else."

Of course, a new organization needs a new logo! Designed by Pink Jacket Studio, the new Center for Inquiry logo (above) both honors and modernizes the established lowercase "cfi" icon, now with the Dawkins Foundation's DNA double helix powering the flame that is our "candle in the dark." We hope you like it as much as we do. Throughout 2017, expect to see further changes in the new CFI's branding and improvements to our digital presence.

We've been building up to this great moment for a year, and we're incredibly excited to bring our work to new heights as a bigger, more impactful, unified organization for reason, science, and secularism. And it's the support of people like you that have made this moment possible and will continue to make possible in the years ahead. If you haven't already, become a member of the new Center for Inquiry today.

# FTC Will Regulate Marketing of Homeopathic Drugs

Ronald A. Lindsay

An agency of the federal government is finally taking systematic action to regulate marketing claims made for homeopathic products.

On November 15, 2016, the Federal Trade Commission (FTC) issued an enforcement policy statement providing that over-the-counter homeopathic products must substantiate any claims of effectiveness with competent and reliable scientific evidence. If no such evidence exists—and it does not exist—and claims are still made for the product, then the product must clearly state on its packaging and advertising that: 1) there is no scientific evidence that the product works; and 2) the product's claims are based on theories of homeopathy from the 1700s that are not accepted by most modern medical experts.

This is a significant victory for evidence-based medicine and for consumers, especially bearing in mind the decades-long, vigorous opposition to meaningful regulation from the homeopathic industry.

**This is a significant victory for evidence-based medicine and for consumers, especially bearing in mind the decades-long, vigorous opposition to meaningful regulation from the homeopathic industry.**

### Background on Homeopathy and the Prior Lack of Regulation

As readers of Skeptical Inquirer are aware, homeopathy is a prescientific theory of medicine that was developed before the advent of modern chemistry and decades before researchers such as Robert Koch first discovered the connection between microorganisms and disease. It is based on two speculative principles. First, there is the "law of similars," which claims that medications should produce symptoms similar to the diseases they are intended to cure ("like cures like"). Second, there is the law of infinitesimal doses, pursuant to which the more dilute the drug, the more powerful the effect. The first principle is, at best, a highly inaccurate statement of the mechanisms of our immune system. The second is flatly contrary to fundamental principles of chemistry and physics.

Not surprisingly, homeopathic drugs are not effective (apart from a placebo effect in some cases). The most comprehensive study on homeopathic remedies was conducted recently by the Australian National Health and Medical Research Council (NHMRC), which issued its report in 2015. After assessing more than 1,800 studies on homeopathy, the NHMRC reached this unambiguous conclusion:

> There is no reliable evidence that homeopathy is effective for treating health conditions [and] people who choose homeopathy may put their health at risk if they reject or delay treatments for which there is good evidence for safety and effectiveness.

Yet despite the lack of evidence (or even a plausible theory) to support the claims made for homeopathic products, the demand for homeopathic products has increased significantly in the past few decades. In the United States alone, $3 billion to $4 billion is spent each year on homeopathic products. A couple of reasons may explain this increased demand.

First, most homeopathic products are used for self-limiting conditions, such as colds or the flu. Almost all patients eventually recover whether or not they take anything. Second, the homeopathic industry has employed very effective, slick marketing techniques that appeal to modern sensitivities. Their packaging and advertising emphasize that their products are "safe, gentle, and natural" with "no side effects." This last claim is undoubtedly true for most homeopathic products—because they produce no effects whatsoever. Moreover, homeopathic marketers also claim their products are "regulated by the FDA," the federal Food and Drug Administration. This last claim, although literally true, is misleading.

When most consumers see that a product is "regulated by the FDA," they assume this means that the product has been tested for its safety and effectiveness and that the FDA has concluded these tests are scientifically sound. With respect to homeopathic products, this assumption would be incorrect.

The 1938 Food, Drug, and Cosmetic Act (FDCA) explicitly recognized homeopathic products as drugs, provided they were formulated in accordance with the recognized homeopathic pharmacopeia. There were multiple reasons for this official recognition of homeopathic products, including the fact that a key sponsor of the FDCA was Royal Copeland, a homeopathic physician. Since the passage of the FDCA, the FDA has essentially taken a hands-off approach to homeopathic products, not requiring that they prove their effectiveness. The FDA has intervened only on occasions where the agency believes that the product or products in question pose a direct threat to health and safety, such as the recent incident involving Hyland's homeopathic teething tablets.

In addition to the special status given homeopathic products under the FDCA, the FDA's lack of effective reg-

ulatory oversight can be explained by the FDA's limited resources and the agency's awareness that in most cases, although homeopathic products are worthless, they do not cause any serious harm—except to the consumer's wallet. Moreover, until the past couple of decades, the market for homeopathic products was relatively small.

The FTC, which has jurisdiction over marketing while the FDA has jurisdiction over product safety and labeling, followed the FDA's lead and generally allowed homeopathic manufacturers and retailers to make unsubstantiated claims for their products.

### CSI/CFI Petitions and Change in Regulatory Approach

In 2011, the Committee for Skeptical Inquiry and the Center for Inquiry filed petitions with the FDA, supported by citations to scientific studies, requesting the agency to either require homeopathic products to be tested for effectiveness or to state on their labeling that they had not been proven effective. The petitions also referenced the booming market for homeopathic products as a reason for the agency to rethink its permissive approach.

Last year, the FDA issued a public notice indicating that the agency was reconsidering its regulation of homeopathic products. CSI/CFI submitted comments to the agency, and Michael De Dora, CFI's director of public policy, testified at the FDA hearing on this issue. The FTC followed suit soon thereafter, issuing its own notice of a possible change to its regulatory oversight. CFI, in conjunction with the Richard Dawkins Foundation for Reason & Science, submitted comments to the FTC.

The FTC's recently issued policy statement confirms that that agency has decided it is time to require the homeopathic industry to change its deceptive marketing practices. Whether or not the FDA will make a similar decision remains to be seen. Although the FTC ruling is a major step in the right direction, it will take a coordinated approach by both agencies to blunt, let alone reverse, the growth of the homeopathic industry. Unfortunately, pseudoscience sells. Too many Americans don't understand basic science. It's appropriate for the agencies with the requisite expertise to insist that the homeopaths be restricted in their efforts to exploit this ignorance. In the twenty-first century, magic potions should not be able to disguise themselves as effective medicine.

#### For Further Reading

Federal Trade Commission, Enforcement Policy Statement on Marketing Claims for OTC Homeopathic Drugs, https://www.ftc.gov/system/files/documents/public_statements/996984/p114505_otc_homeopathic_drug_enforcement_policy_statement.pdf (November 15, 2016).

Australian National Health and Medical Research Council, Evidence on the Effectiveness of Homeopathy for Treating Health Conditions, https://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/cam02a_information_paper.pdf (March 2015).

Ronald A. Lindsay is the former president and CEO of the Center for Inquiry.

## Elizabeth Loftus Wins 2016 John Maddox Prize for Standing Up for Science

Psychologist Elizabeth Loftus, an expert on the malleability of memory, has been awarded the 2016 John Maddox Prize for standing up for science.

Loftus, a CSI fellow and member of CSI's Executive Council, is Distinguished Professor of psychology and social behavior and criminology, law and society at the University of California, Irvine.

Best known for her groundbreaking work on the "misinformation effect"—in which the memories of eyewitnesses are altered by exposure to incorrect information about events—she was also honored for her pioneering research on the creation and nature of false memories. Loftus had to withstand legal attacks and sustained personal abuse from therapists, patients, and others who didn't like her findings.

"I could hardly contain my excitement when I first learned that I would receive the prize, especially since it recognizes the work of people who promote sound, credible science that bears on a matter of public interest and who have faced tough challenges in the process," Loftus said.

Now in its fifth year, the John Maddox Prize is a joint initiative of the international scientific journal *Nature,* of which Maddox was editor for twenty-two years; the Kohn Foundation, whose founder, Sir Ralph Kohn, was a personal friend of Maddox's; and the charity Sense about Science, where Maddox served as a trustee until his death in 2009.

"Standing up for psychological science in general and research on memory in particular has brought a good deal of antagonism my way," Loftus said. "Receiving this award helps to erase the pain of insults, death threats, and lawsuits. And I love the idea that my CV will forever contain the name of the late Sir John Maddox, respected by all for his tireless defense of science."

Maddox was also a CSI fellow, as was last year's winner of the award, Edzard Ernst (SI, March/April 2016).

Fuller details about Loftus and the attacks she withstood appear in fellow psychologist Christopher French's nominating letter to the award committee (page 20).

CSICON LAS VEGAS

CONFERENCE REPORT

Photos courtesy of Brain Engler

**CSICOP invented the skeptics' conference**. Over the past four decades, beginning in 1976, it sponsored dozens of memorable conferences, many in association with major universities and some of them in other countries with international cosponsors.

After a seven-year pause, the conferences resumed in 2011 under the rubric CSICon. The Committee for Skeptical Inquiry (CSICOP's new name as of 2006), now a program of the Center for Inquiry, is the sponsor. Previous CSICons took place in New Orleans, Nashville, and Tacoma. The latest, CSICon 2016, held October 27–31 at the Excalibur Hotel in Las Vegas, brought together close to five hundred scientists, scholars, and skeptical investigators from the United States and around the world in a lively exchange of ideas. This special conference section of the Skeptical Inquirer offers some flavor of the presentations, a few vivid examples of what those who were there in person experienced. Elsewhere in this issue, several feature articles and my conversation with James Randi are based on conference talks and events, with more to come.

—Kendrick Frazier, Editor

## CSICon 2016 Lights Up Las Vegas

Can one be simultaneously dazzled and disabused? Indulging in flights of fancy and still grounded in reality? Nostalgic yet future-focused?

The evidence suggests the answer to all of these is yes. CSICon 2016, the latest conference of the Committee for Skeptical Inquiry, held in Las Vegas October 27–30, contained multitudes.

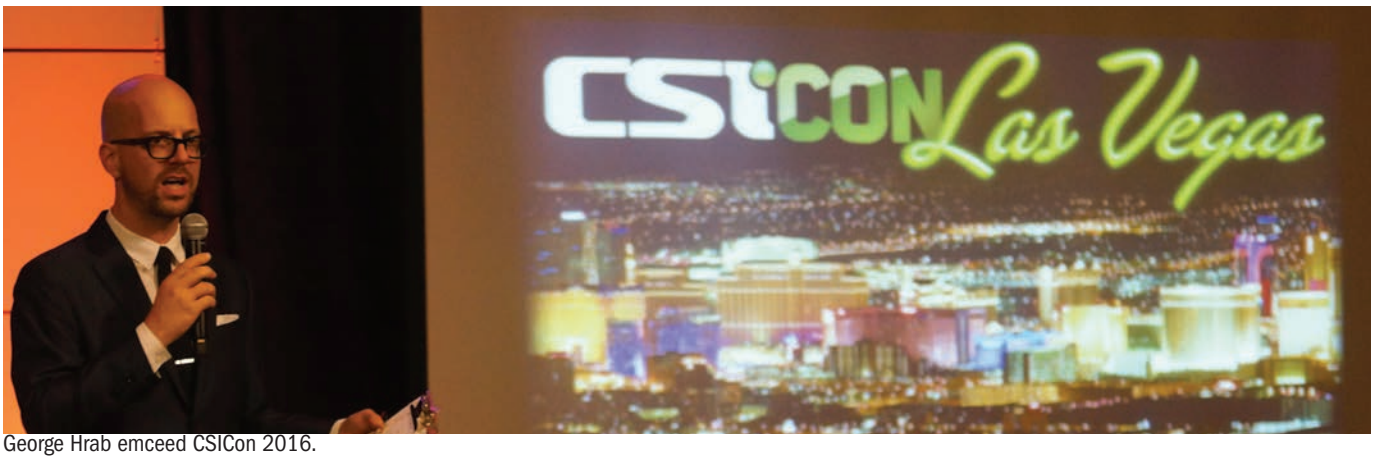
There was a multitude of amazing speakers covering a multitude of enlightening and thought-provoking subjects. Just for a sampling, SETI's Jill Tarter talked about the very real possibilities for life beyond Earth; Paul Offit took on the scourge of opioid addiction; Bertha Vazquez and Eugenie Scott pushed back against the resistance to evolution education; Maria Konnikova showed how con artists use storytelling to ply their trade; Kevin Folta and Kavin Senapathy fought antiscience fear-mongering in food and agriculture; Ron Lindsay reminded us why it remains so necessary to challenge Bigfoot and UFO beliefs; and Joe Nickell exemplified the conscience of investigative skepticism. And much, *much* more.

There was a multitude of deep thoughts and key insights. On two separate nights, two giants of skepticism, Richard Dawkins and James Randi, sat for what proved to be fascinating and intimate conversations about journeys of the past, challenges of the present, and hopes for the future.

There was a multitude of laughs, as George Hrab fully mastered all ceremonies with wit, music, and an infectious enthusiasm; at the Saturday evening Halloween party, folks bravely tried their hand at Weird Al's craft with parody "skeptioke" performances, and Zombie Donald Trump threatened to invalidate the entire party.

One could go on. And CSICon is about more than the events themselves, more than the sum of its parts. It was hundreds of smart, friendly, curious, kind people getting together in a truly fantastical location, and connecting. CSICon was a great success, not just because of the conference itself, but because everyone left wiser, happier, and more enlightened than when they arrived. —Paul Fidalgo ■

Paul Fidalgo is communications director for the Center for Inquiry.




George Hrab emceed CSICon 2016.

# The Enlightenment Wrapped Up in an Organizational Package

*Excerpts from Center for Inquiry CEO Robyn Blumner's welcoming remarks at CSICon 2016 Las Vegas.*

Hello, I'm Robyn Blumner, and I'd like to formally welcome you to CSIcon 2016, an oasis for people who think evidence matters.

Just as quick background, I am the relatively new CEO for the Center for Inquiry. I also head up the Richard Dawkins Foundation for Reason & Science, which is in the process of merging with CFI. The consolidation makes a great deal of sense because our missions are virtually identical—to promote reason, science, freedom of inquiry, secularism, and humanist values.

Or as I like to put it, we're the Enlightenment wrapped up in an organizational package.

So why am I hopeful about the future?

Despite the power of the religious right, despite the rise of Islamic extremism, and despite the intransigence of science denial, I am optimistic. Because the evidence-based world is winning. If you look at the trend lines in this country and beyond, there are some healthy signs for skeptics. Advances in science and technology are making our lives better in ways that are hard to deny.

I firmly believe the future belongs to us: people who embrace critical thinking and who reject appeals to emotionality, tribalism, and dogma. Now all we have to do is survive the present.

But first, the challenge: There are some dismal facts out there. For instance, over 40 percent of Americans say human beings arrived on this earth fully formed within the past 10,000 years. That means four in ten Americans reject human evolution.

Richard Dawkins and I were at the Grand Canyon just before CSICon, and the park staff there is under siege by creationists. The frontline rangers are routinely challenged by people who believe the Grand Canyon was carved by Noah's flood 4,000 years ago. The obvious scientific facts that it took many millions of years for the Colorado River to carve the canyon are irrelevant. The park staff is directed to be non-confrontational; it's politics. Park administrators are afraid their funding will be cut if they challenge even the most outrageous religious claims.

We're not partisan here. We are completely nonpartisan. But we don't have to ignore scientific denial among politicians. So let's talk for a moment about Mike Pence. When Mike Pence was a member of Congress in 2002, he took to the floor of the House to bring some vital news to the public. What was so important that he had to share it with the American people and get it into the Congressional Record?

*Human evolution is a hoax.* Pence said he believed that "someday scientists will come to see that only the theory of intelligent design provides even a remotely rational explanation for the known universe." Pence believes in the biblical account and thinks that should be taught alongside evolution. Yes, that's scary.

To combat the American scourge of scientific illiteracy, one of the programs the Richard Dawkins Foundation is bringing to the Center for Inquiry is called "The Teacher Institute for Evolutionary Science," or TIES. TIES teaches middle school science teachers how to teach evolution. Middle school teachers often come to teaching with degrees in elementary education and don't have the knowledge, tools, or confidence to teach evolution. We give them all three. We've held dozens of professional development workshops across the country in places such as Texas, Florida's panhandle, Arkansas, and North Carolina. Teaching teachers will impact generations of students. And maybe there will be fewer people like Mike Pence as a result.

CFI is also taking the lead in combating other forms of science denial, challenging homeopathy before the Food and Drug Administration, speaking the truth about "cupping" and other absurd and potentially harmful medical fads, and fighting to keep America's kids safe by making sure they get vaccinated.

Our magazine Skeptical Inquirer is the preeminent magazine for scientific skepticism. Many of you are writers and contributors to it and I'm sure many of you are subscribers. It has just celebrated its fortieth anniversary and, even in this challenging environment for print publications, is going strong.

We are living in an era when fake news is accepted as real, science is condemned as ideology, and ad hominem attacks are substituted for reasoned argument. This is why CFI's work to promote reason, science, critical thinking, freedom of inquiry, and empathy—the values of the Enlightenment—is more important than ever. ■

# LEAVE *a* LEGACY *of* REASON

Imagine a future where science and reason serve as the foundation for our lives.

A future where free expression is guaranteed everywhere around the world.

A future where old sectarian divisions have been overcome by the common bond of secular ideals.

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## Maria Konnikova on Stories as a Force for Evil

I used to make my living as a stage actor, and I was lucky enough to do almost nothing but Shakespeare for about five years. To explain what I thought was so important about Shakespeare and theater, I often cite a scene in Al Pacino's documentary *Looking for Richard,* in which a panhandler on the street tells Pacino, "Shakespeare teaches us how to feel." So the stories I helped to tell as an actor could teach people how to feel. I loved that.

*New Yorker* writer Maria Konnikova reminded us at CSICon Las Vegas that as valuable as storytelling is, as intrinsic to the human experience it is, and as much as it does to give us new insights and deeper empathy, "in the wrong hands, stories can be a force for evil." Her topic was con artists. "Con artists are actors; they are storytellers."

You can imagine that this was quite an affecting line of thought for me. The core of Konnikova's message is that humans are not the creatures of fact we think we are. Con artists are actors of the criminal element, and they succeed by weaving a story in which the victim of the con is the good guy, and to not follow through with what the con artist, posing as a victim, needs, is to betray the idea of the kind of people we think we are and want to be. If we default to skepticism, if we show skepticism, when someone seems to be in need, we're violating the story.

Of course this negative power of storytelling is not just applicable to con artists but to almost all areas of our lives.

**The core of Konnikova's message is that humans are not the creatures of fact we think we are.**

Konnikova cited examples such as the law, where cases are won by the best story told. Politicians tell stories of varying degrees of truthfulness, and then another layer is added when journalists tell stories about the stories they're being told.

What she wants us to take away is that the more you want to believe a story, the more you have to rely on the trust-but-verify dictum.

Or, as she says, she sometimes feels compelled to shout, "Humanity sucks; trust no one!" I kind of glommed on to that one. —P.F. ■

Maria Konnikova

## Fake News: Tamar Wilner Is the Hero We Need

On the plane ride to Las Vegas, I took the opportunity to finally watch *Batman v. Superman.* Now, I don't understand all the hate for this movie; I really, really liked it a lot, and I don't care what that makes you think about me. And I loved Wonder Woman in the movie. She was great; Gal Gadot was excellent, and I was all ginned up for the standalone movie. Well done, Warner Bros. You hooked me.

You know who else is interested in Wonder Woman? Tamar Wilner, who came to CSICon 2016 to discuss how we can gather up "strands" for our own virtual Lassos of Truth, just like Wonder Woman has.

Wilner is a great journalist. Seriously. I've been admiring her work since it came to my attention a couple of years ago, when she covered the enraging case of cancer-quack Stanislaw Burzynski in Texas. She's written for CSI's website, and she did an interview on our own *Point of Inquiry* podcast earlier this year.

Not unlike David Helfand (who was on stage just before her), Wilner wants to convey the severity of the misinformation problem on the web, thus her desire to arm us all with Lassos of Truth. The strands are fundamental; none of it should be surprising, but they are so rarely fully weaved together as they need to be in order to effectively process bad information.

Briefly, the lasso strands ask us to:

- Ask if the claim even makes sense—if the text justifies the headline or sounds too good to be true.
- Check if the story is from a satirical/fake-news source (of which there are many, and few of which are actually funny).
- Reference the many fact-checking websites that make debunking their business.
- Ask questions about photos and videos, such as where they were taken and when,

Tamar Wilner

**Wilner wants to convey the severity of the misinformation problem on the web, thus her desire to arm us all with Lassos of Truth.**

whether there are technical issues or inconsistencies, or whether they have been altered.

- Investigate social media sources such as follower counts and how recently an account was created, and indeed investigate the actual humans making claims.

And finally, when you want to spread the good news of the truth you've unearthed, she emphasizes that you not become part of the problem by repeating the deceptive or incorrect claims, giving them more fuel. "Headlining with the myth is really the worse thing you can do."

Do you feel like a superhero now—or at least comparably armed? I do! Tamar Wilner is clearly the hero that CSICon needs and deserves. —P.F. ■

## Jill Tarter: E.T. Whisperer, Possible Martian Descendant

It used to be that we meager humans had no idea how many planets might be out there beyond our own adorable little solar system. Today, we know there are more planets than stars in our galaxy. That's hundreds and hundreds of billions of planets.

Jill Tarter of SETI is really excited about this. I am too.

There are two big discoveries of modern science that have raised her hopes for the existence and discovery of life beyond Earth: the existence of extremophiles on our planet—organisms that can survive and thrive in the most hostile conditions our planet can muster—and of course the discovery of all these exoplanets.

These two factors combined suggest that "the universe might be bio-friendly." Might! If we do find life on another planet or moon, either in our own solar system (with one big exception) or from an exoplanet, "that will mean life is ubiquitous everywhere."

Jill Tarter

**It's entirely plausible that Mars is where our own life began, with Mars seeding Earth with the beginnings of our life. "So, indeed, we could be Martians," Tarter notes**

Why? Because a "genesis moment" somewhere more or less quarantined from Earth would mean that life has the potential to emerge throughout the universe. The exception I mentioned is Mars, which shares too much of a history of "exchanging rocks" with Earth and Venus to make it definitive as to which planet life began on.

That's also a big deal! It's entirely plausible that Mars is where our own life began, with Mars seeding Earth with the beginnings of our life. "So, indeed, we could be Martians," Tarter notes.

*Intelligent* life is entirely different from "mere" life, of course. But while it may be too hard to detect a biosignature from an exoplanet (which Tarter admits we don't even have for Earth life), we could detect evidence of a civilization's technology: "That could be more distinct and distinguishable."

Okay, so why does this matter, beyond being cool?

"One of the best things about SETI is the fact that you have to adopt a much more cosmic perspective," said Tarter. "It's like holding up a mirror to the entire planet and saying, *See? See you guys?* You're all the same, when comparing yourself to something else that co-evolved on a different planet."

SETI, she says, "trivializes the differences between us" so we can "grow up" and develop some kind of global scheme for cooperating. But for that, we have to work together—and not just within our own species. All life forms on Earth have to be included in our thinking and in our coming interstellar moral circle. —P.F. ■

## Mass Misinformation Author David Helfand Warns of 'Google-Fed Zombies'

We human beings, thanks to the Internet, are producing 2.5 quintillion bytes of information every day. We must be really smart, right?

Nope! David Helfand is here to make the case that the information democratization brought by the advent of the Internet is drowning us in misinformation. Those 2.5 quintillion bytes? Helfand says not all of it is carefully edited.

Helfand, professor and former chair of astronomy at Columbia University, is author of the book *A Survival Guide to the Misinformation Age*, and he's concerned that as a society we have collectively decided that "the upper right hand corner of your browser is the equivalent of thinking."

**It is perhaps symbolic that at Google's own employee daycare center, only 50 percent of kids have been vaccinated. The people of Google itself were falling for the bad information that they get by relying too heavily on Google searches.**

The vaccine denial movement is a useful case in point, where misinformation results in tangible harm. It is perhaps symbolic that at Google's own employee daycare center, only 50 percent of kids have been vaccinated. The people of Google itself were falling for the bad information that they get by relying too heavily on Google searches.

Careful not to be taken as some anti-technology crank, Helfand differentiates the information revolutions of printing and broadcast from the Internet. Reading a book or watching a movie, he says, is "an individual act"—passive, with no way to give feedback, and with no way to control the source of information.

Contrast that with the Internet, where we do control the course, curating our own news flow and excluding any information that doesn't conform with our existing worldviews. This creates what he calls "armies of the uninformed."

If the Internet's 2.5 quintillion bytes mostly just reinforces group identity, what do we do? Helfand isn't sure, but he suggests you might start by buying his book. How you'd give him feedback on that book, I'm not sure, especially since he says he doesn't carry a smartphone.

"I live in this wonderful bubble of tranquility." Sounds lovely. —P.F. ■

David Helfand

Richard Dawkins

Stuart Vyse

# The Amazing Cosmos of Gravitational Waves

Physicist, cosmologist, and CSI Fellow Lawrence Krauss of Arizona State University took the CSICon Sunday morning audience on a fascinating tour of an epic new discovery about the universe—the direct detection of gravitational waves, ripples in the fabric of space-time, predicted by Einstein and sought unsuccessfully ever since. Krauss then compounded the excitement by noting that gravitational wave astronomy may be the astronomy of the twenty-first, twenty-second, and twenty-third centuries. Not too shabby!

Lawrence Krauss

**"The two groups hated each other," Krauss said. So what did they do? They began a collaboration with scientists from both teams reanalyzing the data. That is, Krauss noted, how good science works.**

The technical requirements that enabled the LIGO gravitational wave detectors to make their discovery "are amazing" in themselves. ("LIGO" stands for Laser Interferometer Gravitational-Wave Observatory; the project is operated by CalTech and MIT and supported by the National Science Foundation.) A gravitational wave from some extraordinary event in the universe would change the length of the tunnels at each site by just 0.001 the width of a proton. Detection of that precision wasn't even possible the year before the discovery. But the scientists upgraded the technology, and when the two detectors were turned on September 15, 2015, just one hour later the unmistakable signal of a gravitational wave was seen, first at the detector in Livingston, Louisiana, then identically seven milliseconds later at the detector in Hanford, Washington.

In this case, the gravitational waves were created by the collision of two black holes 1.3 billion light-years away, one of which was thirty-six times the mass of the sun, the other of which was twenty-nine times the mass of the sun. In two-tenths of a second, the collision released gravitational energy equivalent to three times the mass of the sun, or more than the light from all the stars in the universe, during that two-tenths of a second. It is "an amazing discovery," Krauss says.

A side note to it all is that the scientists with another project, called BICEP, using liquid-helium-cooled detectors at the South Pole, had published on February 14, 2014, a result that, if true, would be the detection of gravitational waves from the beginning of time, essentially the big bang. But scientists with Europe's Planck satellite were also looking for the same signals, and they asserted that the BICEP signals could be due to intervening dust in the galaxy, not gravitational waves. That seemed to refute the BICEP claims.

"The two groups hated each other," Krauss said. So what did they do? They began a collaboration with scientists from both teams reanalyzing the data. That is, Krauss noted, how good science works. The collaboration still sees a signal in the data, with a likelihood of 92 percent that it is due to gravitational waves. But, Krauss added with evident pride, 92 percent likelihood in physics is not good enough; physicists demand something closer to 99.99 percent certainty before acceptance. So, for now, that "earlier" possible discovery of gravitational waves remains unconfirmed, while the LIGO discovery has scientists awestruck. In December, the detection of gravitational waves was *Science* magazine's 2016 Breakthrough of the Year and *Science News's* and *Discover's* top science story of the year.

Because gravitational waves, difficult as they are to detect, can pass through the stuff of the earliest moments of the universe, whereas electromagnetic waves (light, radio waves) cannot, gravitational astronomy opens "a new window on the universe." Who knows what discoveries await? —Kendrick Frazier ■

# Science Education, Communication on Display at CSICon

Stuart Vyse

One of my favorite moments of CSICon came during Richard Dawkins's onstage conversation with Jamy Ian Swiss. An audience member asked Dawkins to consider the three most important aspects of his career—evolutionary biologist, defender of atheism, and science educator—and identify which one made him most proud. Dawkins said science educator. A man whose book *The Selfish Gene* has just come out in a fortieth anniversary edition (see book excerpt in this issue) and whose *The God Delusion* was a huge bestseller considered science education his most important activity.

Science education is a central concern of the Committee for Skeptical Inquiry, and science educators and communicators were prominently featured in the CSICon schedule. Eugenie Scott, former executive director of the National Center for Science Education and a CSI fellow, spoke about the current state of evolutionary science in schools in the United States. Although she pointed to some positive trends, the overall picture is one of poor quality teaching of evolution and large pockets of resistance. Many teachers take what Scott called the cautious approach to evolution by "teaching the controversy"—as if there *were* a controversy. She reported that science teachers face numerous obstacles as they approach this topic, including lack of knowledge of the subject, lack of time in the curriculum, and negative pressure from students and parents.

Scott stressed the importance of evolution to science education in general by quoting evolutionary biologist Theodosius Dobzhansky: "Nothing in biology makes sense except in the light of evolution." Evolution answers the question of why things are as they are instead of some other way, and without that insight, biology is just a collection of labels and species names.

If Eugenie Scott's presentation was full of challenges, the presentation by Florida middle school science teacher Bertha Vazquez revealed a powerful response to those challenges. Working with Richard Dawkins, Vazquez developed the Teacher Institute for Evolutionary Science (TIES), a program of the Richard Dawkins Foundation. TIES has produced professional development workshops for school teachers to train them in the best practices for teaching evolutionary science. TIES also facilitates partnerships between biologists and teachers to enrich the teaching of evolution and maintains a clearing house of lab curricula and teaching materials. For her efforts as a science teacher and as director of TIES, Vazquez has earned numerous state and national teaching awards.

The importance of accurate communication of scientific topics was also highlighted at CSICon. *Forbes* magazine author Kavin Senapathy described her campaign against Vani Hari, "The Food Babe," who has spread fear of genetically modified (GM) foods and waged unfounded attacks on the Subway sandwich chain, ultimately moving Subway to alter the recipe for their bread. Senapathy called Hari "one of the biggest misinformation vectors of our time" and outlined how she has challenged Hari in her *Forbes* articles and a coauthored book, *The Fear Babe: Shattering Vani Hari's Glass House.*

Senapathy also showed the trailer for the forthcoming *Science Moms*, a short film in which Senapathy and other science-oriented mothers are featured. The film is specifically designed to combat false information about vaccines and GMOs, as well as other pseudoscientific claims affecting children and families. The trailer was met with vigorous applause from the CSICon audience.

Another science journalist, Tamar Wilner, gave an entertaining and practical talk titled, "Make Your Own Lasso of Truth," a reference to the comic book character Wonder Woman who could compel bad guys to tell the truth by capturing them in her golden lasso. Directing her talk primarily toward the extensive misinformation that exists on the Internet, Wilner gave suggestions for identifying fake news sites, checking facts, and detecting doctored images. Wilner is a regular contributor to the *Columbia Journalism Review* and to the fact-checking project at the American Press Institute.

The promotion of effective science education and fact-based journalism is central to the mission of CSI, and it was wonderful to see these efforts given such prominence at CSICon and to have them so warmly received by an enthusiastic audience. ■

Stuart Vyse is a psychologist and CSI fellow and the "Behavior & Belief" columnist for Skeptical Inquirer and csicop.org.

# Still 'Amazing': A Conversation with James Randi

## Part 1

The famous conjuror, investigator, and author—and founding fellow of CSICOP—sat down with Skeptical Inquirer Editor Kendrick Frazier at CSICon 2016 Las Vegas for a live, ninety-minute onstage conversation. Here are excerpts.

**Kendrick Frazier: It's such a delight for me to be here with you. Our pasts have happily intersected a number of times over these four decades.**

**Before CSICOP was founded, you and Martin Gardner and Ray Hyman were trying to come up with some organized enterprise to deal with paranormal nonsense and flim-flam in society.**

**James Randi:** Yes, the folks you mentioned were very instrumental in promoting the idea of getting a foundation ready to handle the so-called paranormal. I'd known Martin Gardner for many decades of course. I miss him more than most people who have passed on, I can tell you. Martin was an astonishing man.

Martin Gardner often spoke to me by telephone when I lived in New Jersey, and he lived in Croton on the Hudson. Even later when I moved off to Florida, I'd get calls from him every now and then.

He called me one day, we were chatting away, and there was a pause on the other end of the line when he said, "Randi, I have to tell you something." I said, "Yes?" and I thought, "What can this be?" He told me, "I'm a deist." A deist is someone who has a basic belief in a god of any shape or form, someone who has an interest in a superior power of some kind.

**"I might as well get this off my chest, at the very beginning. I think that the belief in a deity is such an, first of all, unprovable claim."**

He said, "I have no evidence whatsoever to support my belief in a god. None." He said, "You have all the evidence to the contrary. I've read it, I've read what you've said, I've heard what you've said, I've read books and books and books on it. They have all the reason on their side, the people who say there is no god." I interrupted, I said, "Martin, I've never claimed there's no god because I can't prove that." He said, "No, I know that's your stance," and it always has been my stance. I don't say there is no god because I can't prove there is no god. I barely say, "I don't see enough evidence in nature to believe in a deity."

He said, "I'll tell you again, you have the whole case in the bag. I have no evidence to sup-

port my view at all." That's the kind of guy that Martin Gardner was. He would state the whole case. I said, "Martin, if that makes you comfortable," and he said, "Yes, it does." He said, "That's why I have that belief; it makes me a little more comfortable about my life."

I said, "That's all I need. You're a good friend. You're an excellent friend, long time friend. All I need to do is hear you say that, and I accept that that is your conviction and I won't argue with you about it." He just said, "Thank you." That's how Martin was. If it gave him comfort, I was all for it.

**In later years, I heard some criticism of him from fellow skeptics about that, but I think the skeptic community can certainly deal with a deist in the house, can we not?**

Kendrick, I might as well get this off my chest, at the very beginning. I think that the belief in a deity is such an, first of all, unprovable claim and such a rather ridiculous claim. I really look at it as ridiculous. I think it's an easy way out to explain things to which we have no answer. There are many things, folks, to which we have no answers, no question of that.

I just think that a belief in a god is one of the most damaging things that infests humanity at this particular moment in history. It may improve. I see signs that it may be improving. I'll leave it at that.

**I was delighted when in 1976 I heard from Paul Kurtz that they were founding an organization that turned out to become CSICOP. You were a founding fellow, and Ray Hyman was and Carl Sagan and Isaac Asimov, and Jim Alcock came along very soon and many others. What did the founding of that organization in 1976 mean?**

Yes, that's very true. We had to get an organization going. During one of the first meetings they said, "Of course, you'll be the head of it, the main figure." I said, "No, I'm in show biz. I'm a magician, ho, ho, ho. I'm a theatrical character. I work on TV and in theaters and I go out and entertain kids and adults. An entertainer should not be the head of an organization like that."

I said, "However, I do know of this gentleman. . . " It was Paul Kurtz of whom I was speaking. I said, "He has made a lot of good statements about the problem of believing in the paranormal and the supernatural." I said, "We should approach him." We did approach him, and Paul graciously agreed to accept the position. That's the way it turned out. You have to have an academic. You have to have somebody who has some standing at a decent desk. Let's put it that way.

**Paul Kurtz was a different kind of person, but the combination of all these perspectives and backgrounds helped bring some solidity to the organization, CSICOP, would you say?**

Paul was very good. First of all an excellent academic in so many ways. He proved that many, many times with all his books, beautiful books that he wrote. Very concise and very factual and very convincing. Don't ever hesitate to open up a Paul Kurtz book and read a chapter out of it; it's always inspiring.

The fact that he was an academic, at a university, and he had the time, he had the interest. That was very important. Paul Kurtz worked out very, very well I must say.

**There was another important figure at the time who turned out later to be a bit of a burr under our saddle. That was Marcello Truzzi.**

You just said a dirty word.

**He was actually the first co-chairman of CSICOP, with Paul Kurtz, and the first editor of *The Zetetic*, which a year later when I became editor (1977), we renamed the Skeptical Inquirer. He was a sociologist of science at Eastern Michigan University.**

Yes, Marcello was a strange guy in many ways. We had to take him off the job simply because he insisted that we should have an equal number of pages from the pro-paranormal people and an equal of the anti-paranormal people. You can't do a magazine like that. That's ridiculous. You'll have two completely different philosophies in the same book and opposing one another. No, that was not doable.

**I want to ask you about one other key figure in the skeptical movement, less well known and appreciated today but very much in the public eye back then: Isaac Asimov. He wrote the foreword to your book *Flim-Flam!***

Yes, he wrote the foreword to a couple of my books as a mat-

ter of fact. Isaac Asimov, that's a name to conjure with, there's no question about it. Isaac Asimov.

**How would you describe CSICOP in those early years?**

We had a lot of exchanges of information with the press and with the media in general. This is before television was really the big thing that it is now of course. I think we had a very substantial influence on the printed media, particularly the printed media, in those days. There was so much nonsense and there's even more today.

That's what we were concerned with. We had to get into the media. I know that I exchanged a great number of personal letters with individual columnists. I found that was the way to go. I made contact with Johnny Carson, and I found out immediately that he was on our side, very much on our side. He wasn't only a comedian, ladies and gentlemen. He was a great thinker.

Before the taping of my appearances on his *Tonight Show*, John would knock on my dressing room door. He just wanted to come around; he was so thoughtful and kind to me. He'd just simply ask, "What should I mention? What do you want me to plug? What do you want me to emphasize? What do I say if I'm asked so and so?" He wanted to be aware of how he could help me. He liked me and he liked what I did. We got to be very close.

The night that we exposed Peter Popoff—we got him and we got him good.

**What made you a skeptic?**

Since I was a kid I'd been very skeptical. I got my introduction to religion. . . I went off to Sunday school. Then they started to read to me from the Bible and I interrupted and said, "Excuse me, how do you know that's true? It sounds strange." "It's in the Bible. It's in the holy book of God." Okay. I'd look around, they were all staring at me as if, "What kind of a critter is this?"

At the end of the class, they questioned me before I left and they said, "Why are you asking all these questions?" I said, "It's a classroom and I thought I could ask questions. How do you know that's true?" Never mind. They gave me a note to take to my parents and it simply said something to the effect that your boy Randi—that's my real first name—is not necessarily welcome here at St. Cuthbert's because he asked too many questions and he interrupts the teachers.

**You were a skeptic of religion before being a skeptic of the paranormal?**

Yes, but with the same flavor.

**What role did Houdini play as a role model in your life of magician, escape artist, illusionist, becoming an educator to the public about paranormal claims, and a debunker?**

When I first found out about Houdini, of course I read several books on him and some of his autobiographical material as well. I saw that he was against all paranormal beliefs. "Fooling With the Spirits" was a program he did on vaudeville with his wife Beatrice where they did a fake mind reading act that exposed the whole thing. That went on for some time on the Orpheum Circuit.

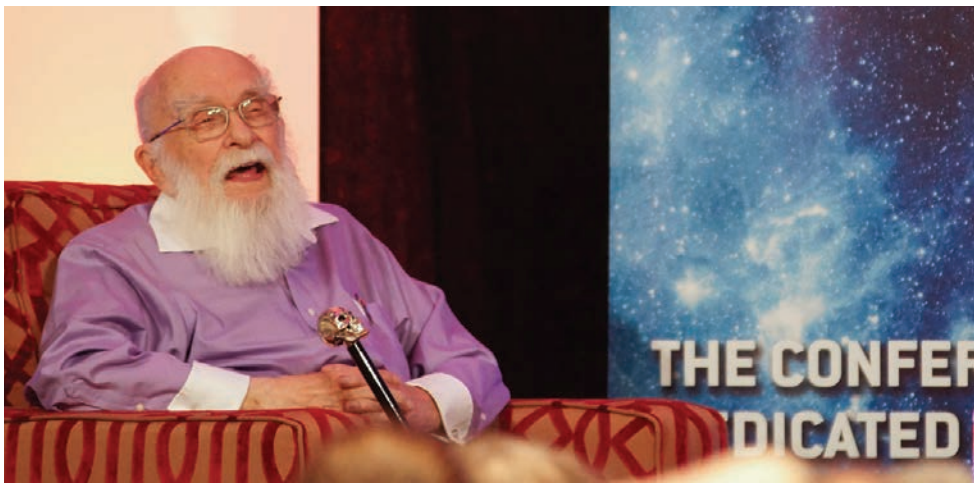
He died two years before my birthday, as a matter of fact. I thought that would be a good example. I took up being Harry Houdini, though I never claimed to be him. As a matter of fact, during my career I broke a couple of his records.

I must add very quickly that when I broke the records that Houdini had established, such as being sealed in a coffin underwater with no additional oxygen, etc., I broke it by a very slight margin purposely, because I didn't want to outdo it, because I was a good twenty years younger than he was when he did it. He did some of these records shortly before he died. He didn't die as a result of any of the experiments or stunts. I thought that was not fair to say that I had broken his record, because I was simply younger at the time.

**Let's jump ahead to one of the investigations that you and I and Paul Kurtz, Phil Klass, Jim Alcock, and Barry Karr went on. Our trip to Beijing, China, in 1988 to investigate a whole variety of paranormal claims. We were invited by the editor of a science daily newspaper to bring particularly Randi's expertise to examine these claims that were getting publicity all over the world.**

**I want to set the scene for what it was like in China with Randi there in 1988. This was not the modern commercial China we have today. They were just coming out of the Maoist period. A lot of people on the streets were still dressed in very gray drab clothes. There were tens of thousands of bicycles, very few cars. Here we were with the great Randi, the Amazing Randi, with his cape and beard and black hat on the streets of Beijing. It was quite a sight.**

Yes, it was indeed, and it was a great adventure.



**It was indeed. At this conference, we've seen a film clip that Phil Klass took during our China investigations of this woman writhing on a table while the Qigong master is in the other room doing his thing, and she is supposedly responding to it. But you set up the controlled conditions where she didn't know when he was doing his thing and vice versa. I was the record keeper. It was a fairly astonishing thing for us to see. Describe what you remember about that.**

I remember that the Qigong master wasn't very happy about that when we suggested the protocol for it. The woman on the table, she must have been very embarrassed because he would be going through his things like this and we put up the screen, the whole business, and she would suddenly start kicking like crazy, as you see in the film.

Then she would open her eyes and look around as if to get a hint as to whether she should have done that. She was rather disconcerted to say the least. I was embarrassed because it caught them out that it just didn't work, because she didn't move when he signaled her to move.

The parapsychologist who ran these tests with ["psychic"] kids was named Mr. Ding. The kids got such lax conditions, it was just ridiculous. They were supposed to tell how many matches were in a box with a certain color on them or what the colors were. Mr. Ding ran the tests.

They were always right, except one of the little flaws in his experimental protocol in my mind was that they were allowed to go into the school yard and play around with the boxes and maybe even peek into them, as you could imagine.

We suspected them of that, but of course Chinese children wouldn't do a thing like that, would they? And they were always right—until we taped up the boxes. They didn't understand why we would tape up the boxes. Maybe because you're peeking, I don't know. The experiment rather failed at that point.

This Mr. Ding, you've heard he went to prison. The government actually caught on to this and they decided this was a disgrace to the Republic of China.

**Back then sometimes people would say, about you, "You're just a magician. What do you know about scientific investigation?"... In other words that you're biased or closed minded. How do you respond to that?**

If you want to take a look at it, I think my mind is pretty open. You can see right here. I show my head really freely, and you could almost read right through it. I don't have scientific training. I learned in high school in Canada; I must say I learned much more physics and chemistry than the average American child. At that time, we learned. What we got out of high school in Canada, we were one year ahead of New York schools in the learning spectrum. We were much better informed. We were pretty well ready to go into first year of college.

**"If you want to take a look at it, I think my mind is pretty open. You can see right here. I show my head really freely, and you could almost read right through it."**

**I was going to ask you how you became so knowledgeable about science and the processes of science to impress the worldwide scientific community. That's where it was, in high school?**

I must say, I owed a lot of it to Mr. Tovell, our physics teacher. He was a brilliant man. I only found out, about three years ago, he was much more qualified than for just a high school teacher. I don't know why he took that position, but he was brilliant. Mr. Tovell would do wonderful things.

When he heard the two-minute bell to mark the change of class he would go to the blackboard and he would uncover something he'd written on the blackboard the previous day or night, and it would often be something like a perpetual motion machine. He would say, "This doesn't work. Tomorrow I'm going to ask you a few pertinent questions about whether it does work or not. If you think it does work we'll build it and we'll see whether it works." That was the kind of teacher he was. This was off the books. This was way off the books.

**This goes to show you what a really great science teacher can be.**

Yes, any teacher of any kind, but particularly of science. He was a great teacher in that way. Good teachers. Mr. Chrysler, my English teacher, and Mr. Henderson, my mathematics teacher, who I bothered for endless days I'm sure, after hours, asking him to tell me what integral calculus was all about because we didn't take calculus at that time. Today I can do a *dy* over a *dx* rather swiftly I think. I actually got to use calculus. I was interested, and I did this at home.

**Obviously you could have become a PhD if you cared to go that route.**

A real FUD? I didn't want to go that way. It came about at the Casino Theater. It's now only a pile of dust someplace on Queen Street, but I saw the great Harry Blackstone. If any of you are amateur magicians, you will know right away who Harry Blackstone was. Not Harry Blackstone Junior—who I also knew and met of course—but the senior Harry Blackstone. He levitated a living woman on stage. That's not easy to do. I thought it wasn't easy to do. It's actually pretty easy to do. ■

*Part 2 will appear in our next issue.*

# The John Maddox Prize Nomination for Elizabeth Loftus

Here are extended excerpts from Goldsmiths College (University of London) psychology professor Chris French's letter nominating Elizabeth Loftus for the 2016 John Maddox Prize (see News and Comment, p. 7).

CHRIS FRENCH

I would like to nominate Professor Elizabeth Loftus for the John Maddox Prize. She is an outstanding candidate with respect to all of the listed criteria:

- How clearly the individual communicated good science, despite adversity.
- The level of responsibility they took for public debate, and going above and beyond their job requirements.
- How effectively they placed the evidence in the wider debate and engaged others.

**Biography**

Elizabeth Loftus (usually referred to as "Beth") spent almost three decades at the University of Washington, Seattle. She was determined to carry out research with direct relevance to real-world issues and thus became the world's leading researcher in the area of the unreliability of eyewitness testimony. Her innovative studies showed convincingly how leading questions could influence witness reports. For example, if participants are shown a video clip of two cars colliding, participants will give different estimates of speed depending upon whether the cars are described as "making contact with," "colliding with," or "smashing into" each other. Her research also demonstrated what has become known as the *misinformation effect*. This occurs when, after viewing an event, a witness is subtly presented with misinformation about that event. For example, a questionnaire administered after the event might include a question asking, "What was the color of the car next to the stop sign?" In fact, the sign was not a stop sign, but when memory is tested some time later the misinformed witnesses are more likely to report that they did indeed see one. Such effects are amongst the most robust and widely replicated within the discipline and are routinely described in virtually every introductory psychology textbook. Her book, *Eyewitness Testimony*, won a National Media Award for a Distinguished Contribution from the American Psychological Foundation. The implications of such work for the criminal justice system are obvious and, as a result, Elizabeth Loftus has been called as an expert witness in hundreds of criminal cases, including high profile cases such as Ted Bundy, the Hillside Strangler, and Oklahoma City bomber Timothy McVeigh. Loftus took the greatest pleasure in helping to acquit those whom she believed had been falsely accused of brutal crimes on the basis of faulty eyewitness testimony.

Having been at the forefront of one major wave of memory research, that of the unreliability of eyewitness testimony, Loftus went on to lead a second major wave of memory research: that of research into false memories. A false memory is an apparent memory for an event that either never happened at all or else happened in a completely different way to the way in which it is remembered. The issue of false memories took on great significance back in the 1980s and 1990s when numerous cases were reported in the United States and elsewhere of patients in therapy apparently recovering memories of being the victims of childhood sexual abuse, typically at the hands of their own parents, despite having had no such memories prior to going into therapy (often for common psychological problems such as anxiety, depression, etc.). Such cases were seen by some psychotherapists as proof of the psychoanalytic concept of *repression*. The idea is that if a person experiences a severely traumatic event (such as being the victim of childhood sexual abuse), this automatic defense mechanism kicks in and pushes the

memory for the event into the subconscious mind. It can then no longer be accessed by the conscious mind, but it can still exert a toxic influence leading to the development of various psychological problems in adulthood. The problem is that there is very little evidence to support the existence of repression—after all, no one ever forgot being in a concentration camp. Most experimental psychologists who study memory are extremely skeptical regarding the concept of repression, pointing out that the available evidence suggests that traumatic events are in fact much more likely to be recalled than non-traumatic events.

Loftus's interest in this issue was sparked by a legal case in which a man was on trial for murdering a child many years previously. The charge had been brought when his daughter allegedly "recovered" the memory of his criminal act, having repressed it for many years. Loftus suspected that the daughter's memory may have been a false memory based upon reading the many accounts of the case that had appeared in the media.

To study this phenomenon, Loftus and her collaborators developed several different techniques aimed at implanting so-called "rich false memories" in volunteer participants. Rich false memories are detailed false memories for entire events that never actually happened. One technique for doing so involves repeatedly interviewing participants and asking them to recall in as much detail as possible various events from their childhood, details of these events having been obtained in advance of the experiment from the participant's parents. However, along with the true events, participants are asked to recall an event that never actually took place. In Loftus's first study of this type, participants were asked about the time when, as a child, they got lost in a shopping mall and were eventually reunited with their parents. The technique was successful in implanting detailed false memories in several participants and has since been used by Loftus and many other researchers to implant false memories for a wide range of other events (despite still commonly being referred to as the "lost-in-a-shopping-mall" technique). Other techniques used by Loftus to implant false memories involve the use of false feedback, (bogus) dream interpretation, and guided imagery.

Elizabeth Loftus

Credit: Brad Swonetz/Redux/Eyevine

**The problem is that there is very little evidence to support the existence of repression—after all, no one ever forgot being in a concentration camp. Most experimental psychologists who study memory are extremely skeptical regarding the concept of repression.**

This line of research by Loftus and others established beyond all doubt that human beings are susceptible to false memories. Furthermore, a very strong case could be made that the conditions under which certain forms of therapy took place provided the perfect context for the development of such false memories. Some of the memories so produced were of extreme forms of ritual satanic abuse involving human and animal sacrifices, cannibalism, sexual perversion, and so on. No forensic evidence has ever been found to support such claims, providing further proof that they are almost certainly based upon false memories.

It was particularly her research into false memories that led to Loftus being

attacked by those who continued to believe that recovered memories reflected events that really had taken place. Inevitably, emotions run high with respect to this issue. Patients had gone into therapy because they were psychologically vulnerable and, as a result of the therapy, ended up believing that they had been the victims of the most horrendous abuse. Families were torn apart and the accused sometimes found themselves facing criminal charges. When Loftus appeared as an expert witness casting doubt on the veracity of such memories, it was inevitable that she would upset many people, not least the therapists and patients in question. Her testimony has, however, undoubtedly helped to acquit several people falsely accused of abusing children. Further details of the adversity that Loftus has had to face are presented below.

For now, it should be noted that her work in this area played a major role in her decision to accept a distinguished professorship at the University of California, Irvine, in 2002. Here, new lines of research opened up, particularly investigating the consequences of implanting false memories. For example, she has shown that implanting a false memory of having gotten sick as a child as a result of eating particular foods will lead to an aversion for that food in adults. Conversely, if you are led to believe that you really liked some healthy food item as a child, it will increase your desire to eat more of that food. Loftus is very aware of the profound ethical issues raised by such research and has carried out research surveying people's attitudes towards the potential for mind control that further advances in technology could produce.

### Adversity

Like all good scientists, Loftus has always enjoyed respectfully arguing with colleagues for her favored theoretical position based upon empirical evidence and sound reasoning. Such debates can get quite intense at times but should never become personally hostile. However, Loftus's appearances as an expert witness in various high profile cases of alleged historic sexual abuse triggered extreme hostility in those who did not agree with her conclusions.

**Like all good scientists, Loftus has always enjoyed respectfully arguing with colleagues for her favored theoretical position based upon empirical evidence and sound reasoning.**

In 1997, Loftus read about a case that, it was claimed, proved that repression really did occur. Psychiatrist David Corwin had recorded his interviews with a six-year-old girl referred to as Jane Doe. Jane's estranged parents were involved in a vicious battle for custody of Jane, and it was alleged that Jane had been abused by her mother. The mother lost. Eleven years later, Corwin again videoed Jane being interviewed and recorded her first appearing to be unable to remember the abuse and then apparently recovering the memory. On the surface, the evidence appeared to prove that both repression and recovered memory were, in fact, valid concepts. That was the conclusion proclaimed by many therapists.

Loftus, however, was not convinced and decided to investigate further. Using public records and newspaper reports, she managed to identify the Doe family. She suspected that Jane's initial stories of abuse may have been coached in order to win the custody battle. Having interviewed both Jane's mother and her former stepmother, she became even more convinced that Jane's memories of abuse were probably false.

Before Loftus had published any of the results of her investigation, Jane Doe emailed the University of Washington complaining that Loftus's investigation constituted an invasion of her privacy (this was despite the fact that she had already spoken openly about her claims and allowed her face to be seen). Loftus was given fifteen minutes' notice before someone arrived at her office and seized her files. She was exonerated following a stressful twenty-one-month misconduct investigation. Understandably, she felt badly let down by the University of Washington, having worked there for a quarter of a century. More than that, she felt utterly betrayed.

Almost the first thing that Loftus did following her exoneration was to publish an account of her findings in Skeptical Inquirer magazine (Loftus and Guyer 2002a; 2002b). In an accompanying article in Skeptical Inquirer, Carol Tavris (2002, p. 43) provided an account of this painful episode and urged readers to appreciate "the courage, persistence, and integrity of those skeptical inquirers who are still willing to 'offend' in the pursuit of truth and justice."

Loftus could not forgive the lack of support that she had experienced from the University of Washington, and she never received from the university a proper apology for what they had put her through. One year later, she accepted a position as a distinguished professor at the University of California, Irvine, despite a generous counteroffer from Washington. She was sad to leave her friends and colleagues of many years at Washington but soon made great new friends and colleagues at UC–Irvine.

However, it turned out that the Jane Doe nightmare was not yet over. In 2003, Jane Doe sued Loftus using her real name—Nicole Taus—despite the fact that Loftus had not revealed her true identity in any publication. Taus also sued Mel Guyer, a lawyer and psychologist from the University of Michigan who had assisted Loftus in her investigations, and Carol Tavris, who had written about the case. Taus asked for $1.3 million for invasion of privacy, defamation, and other claims. After several years of litigation, three California courts rejected all but one of the twenty-one allegations. Against her wishes, Loftus's insurance company decided to accept Taus's offer to withdraw the one remaining allegation in return for $7,500. This is known as a "nuisance settlement" and simply reflects the fact that it would have cost the insurance company more than $7,500 to fight the case in court. The California Supreme Court judge ordered that the trial judge determine how much Taus would have to pay to cover the defendants' costs; the total came to almost $250,000. Taus declared bankruptcy soon after.

It is fitting to sum up this sorry episode with Loftus's own words from a forthcoming autobiographical chapter for the *Annual Review of Psychology*:

> During this protracted and miserable legal process, I learned a great deal about the vulnerability of academics to lawsuits. Scholars are not always afforded the full protection of constitutional guarantees, and this is especially true when the scholars work on problems that matter in people's lives—and are therefore likely to be sources of controversy or conflict. But these are precisely the kinds of scholarly inquiries in which there is a profound need for our institutions to provide vigilant protection of free speech.

Despite the adversity she has faced, Loftus has never wavered in her dedication to carrying out research of the highest quality with real-world impact and to communicating her findings to the widest possible audience. I cannot conceive of a more worthy recipient of the John Maddox Prize, and I hope that the panel agrees with my assessment. ■

For further details (including full CV), see: https://socialecology.uci.edu/faculty/eloftus

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# Let Your Questioning Start with Wikipedia

SUSAN GERBIC

Do you remember January 18, 2012? That was the day many websites protested the Stop Online Piracy Act (SOPA) and Protect IP Act (PIPA), which were proposed laws in the U.S. Congress. Wikipedia for a whole day blacked out their site, instead displaying the message "Imagine a World Without Free Knowledge" and asking people to "make your voice heard." Social media lit up with discussions about what it would be like not to have a resource like Wikipedia. Even though I was more than aware of the Wikipedia blackout, I tried three times to access the site to get more information about something. Each time I got the blackout screen, I said to myself, "Susan, what are you doing?" It was just a reflex, like when you lose your phone and your first reaction is to call people and tell them you can't find your phone.

Wikipedia seems to have been around for decades. It permeates our online experience. In fact, Wikipedia has existed only since January 15, 2001. That means that we are starting to see people graduate from high school and college who don't remember a time when Wikipedia didn't exist.

This world of instant information is much different from the world I grew up in. When I graduated from high school in 1980, we had three channels on the TV, one hour of news coverage, public libraries, and the *Encyclopedia Britannica* for our information. If we wanted to know something about a topic that was unusual—such as the Bermuda Triangle, Bigfoot, or the subject that scared me the most, spontaneous human combustion (SHC)—our resources were limited.

Being a part of the Greatest Generation, my parents bought the *Encyclopedia Britannica* and all its Books of the Year. I still have them all, many volumes of various sets of encyclopedias. And so I recently looked. My parents' volumes are from 1957, and nothing is mentioned about Bigfoot, Sasquatch, Bermuda Triangle, or SHC. I searched through the 1988 set I have and there is an entry for the Bermuda Triangle, but it's only a few sentences long. The entry tells vaguely where the Triangle is located and then takes a skeptical attitude, going so far as to call the stories "fanciful." There was no entry for Bigfoot or Sasquatch, and but there was a single paragraph for "spontaneous combustion" (with no mention of humans being involved).

I wonder why more people of my generation aren't more credulous considering we didn't have access to good information about the paranormal. If we were to find a book in the library, it would have probably been pro-paranormal.

When starting to question long-standing beliefs, people tend to do some "research." That is, they go to a computer, use their favorite search engine, and start reading or watching videos. We know that usually the first link they get will be to a Wikipedia page, though what they find there is anyone's guess. Hopefully what they read will be accurate, well written, and have plenty of citations they can follow for more information.

As an example of how influential Wikipedia can be, I recount this story. Not long ago I was listening to an interview with Jeremy Runnells and was struck by his deconversion story. Runnells had been in the Mormon Church all his life. He spoke about the terrific experiences he had during his time as a Mormon. He loved the people he worked with, and he was considered a bit of a Mormon scholar. One day he was listening to an interview about Brigham Young, and the words *polygamy* and *polyamory* were mentioned. *What?* Then they mentioned that Brigham Young had been married to women whose husbands were still living. *What?* Curious, Runnells went to the Internet to find out more. Very quickly, he ended up on the Brigham Young Wikipedia page, and there it was: polygamy and many, many wives. The next thing he knew he had clicked on the link for Young's wives and found a genealogy chart. One wife was only fourteen years old, and several had been still married to their non-Mormon husbands.

Runnells was very surprised and did not trust what he was reading. So he kept reading and following links and verifying what he was learning. He eventually wrote a seventy-page "open letter" to his church leaders asking questions about what he had learned. The only sources he used in this essay were Mormon ones. The "CES Letter" (directed to the director of the Church Educational System

and available at http://cesletter.com/) is now infamous and is credited with many Mormons losing their faith in the church. They learned what Runnells did: that a lot of Mormon history isn't taught.

When Runnells first read the Wikipedia page, his thought was "If this is true, then what *else* have they been withholding from us?" In April 2016, Runnells held a press conference and excommunicated the LDS church before they had a chance to kick him out. "The only power the church has," he said, "is the power you give them. Tonight I took back my own power."

The interview he happened to hear set him off to the Internet, and his first searches gave him the Wikipedia page. If you do the same, you will probably see the same genealogy charts and information Runnells did.

In a Skeptical Inquirer online interview with Donald Prothero and Daniel Loxton, Kylie Sturgess asks them if cryptozoology is a "potentially dangerous field for people." Prothero explains that creationists are the new cryptozoologists. "It's a big part of what they think is their ministry, because they have this bizarre notion that somehow if they find a Mokele-Mbembe [extant dinosaur] all of evolution will come crumbling down, as if one late-surviving species somehow changes anything." (See http://www.csicop.org/specialarticles/show/mythbusting_monsters_abominable_science_with_daniel_loxton_and_donald_proth.)

The *Herald Scotland* reports that in Louisiana children are taught in their schoolbooks to believe that the Loch Ness monster is real, and thus it supposedly challenges the notion that Earth is millions of years old. (See http://www.heraldscotland.com/news/13062835.How_American_fundamentalist_schools_are_using_Nessie_to_disprove_evolution/.)

What is going to happen when these schoolchildren start to wonder about Nessie and the Mokele-mbembe? They will eventually find the Wikipedia page and learn that these are cryptozoological creatures and no more real than King Kong or the Easter Bunny. What will happen to their faith in all the other statements they learned in church and from their parents? I hope that, as with Runnells, they will wonder, "If this is a lie, then what else is a lie?" and they will fall into the rabbit hole of following links and reading more. To so many hundreds of thousands of people, Wikipedia is the starting point to send you down that rabbit hole so many of us have found ourselves in.

In the preface to the book *Abominable Science!* by Loxton and Prothero, Loxton explains how he had a lifelong love of cryptids. He spent long hours in the public library reading and planning his "future monster-hunting expeditions." It was only when he was in his late teens he attended a conference and met CSI Fellow Barry Beyerstein that Loxton learned that there was a world of "parallel literature I had never heard of." When he went to university, he discovered a "large cache of Skeptical Inquirer magazines" and that was that. Loxton explains that growing up, unless it was something you found in the library or it was mentioned on the news, there was really no access to anything critical of the paranormal. (See http://meettheskeptics.libsyn.com/mts-meet-daniel-loxton.)

Thankfully Skeptical Inquirer exists. Wikipedia editors have cited these articles over many of the cryptozoology and paranormal pages. We must have noteworthy citations to use on Wikipedia, and without the handful of skeptic books and articles, the Wikipedia pages would lack criticism. Readers would only read pro-paranormal content. In order to educate, the skeptical community must work together with Wikipedia editors to get the best quality information in a place where people are accessing it. And people are accessing these pages.

Only existing since 2001—and in the beginning it was pretty rough—Wikipedia has become the go-to place for most of our knowledge. People such as me and my Guerrilla Skepticism on Wikipedia (GSoW) team of Wikipedia editors strongly believe that we have a responsibility to make sure that when someone is starting to wonder, whatever they find is full of neutral and factual information all backed up by citations. It does not matter if the searcher is looking for information on homeopathy or Bigfoot; all that is needed is for them to start down that road of "Why wasn't I told this? What else is being hidden from me?"

Fast forward to 2016, and the GSoW project is struggling to work our way through all the Wikipedia pages concerning scientific skepticism. We are vetting the pages and making sure the best citations exist for curious readers to follow. No other project existing today is educating on this level and in multiple languages. We are always looking for more people to join who we can train.

Think about how often you turn to Wikipedia as your go-to source for information, as the place you begin your research. Think about the millions of other people who are also visiting Wikipedia. Remember that there are real people volunteering their time to make this online encyclopedia a better source for everyone. We don't know, but we might be inspiring the next Daniel Loxton or Ben Radford—or the child of the creationist who is wondering what the story behind Nessie really is. Or possibly someone like Runnells who has just heard a criticism challenging his belief system and is looking to understand the argument so he can refute it, only to find that the criticism was true.

Wikipedia, if ignored, can be the bane of stupidity, or it can be the answer to a call of rationality and great science education. Considering it is freely editable by anyone, you might be the solution we need.

For more information about the GSoW project, visit our YouTube channel and consider joining the Secret Cabal hidden away on Facebook. Write to us for further information at GSoWteam@gmail.com. ■

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# Miracle Tableau: Knock, Ireland, 1879

In January 2015, I acquired for my collection a rare Currier and Ives print—an original hand-colored lithograph (Figure 1)—depicting a supposedly miraculous occurrence at Knock, Ireland, in 1879. I had written about this event previously (Nickell 1993, 175–176), but I now decided to see if the apparitional experience could be explained in more detail.

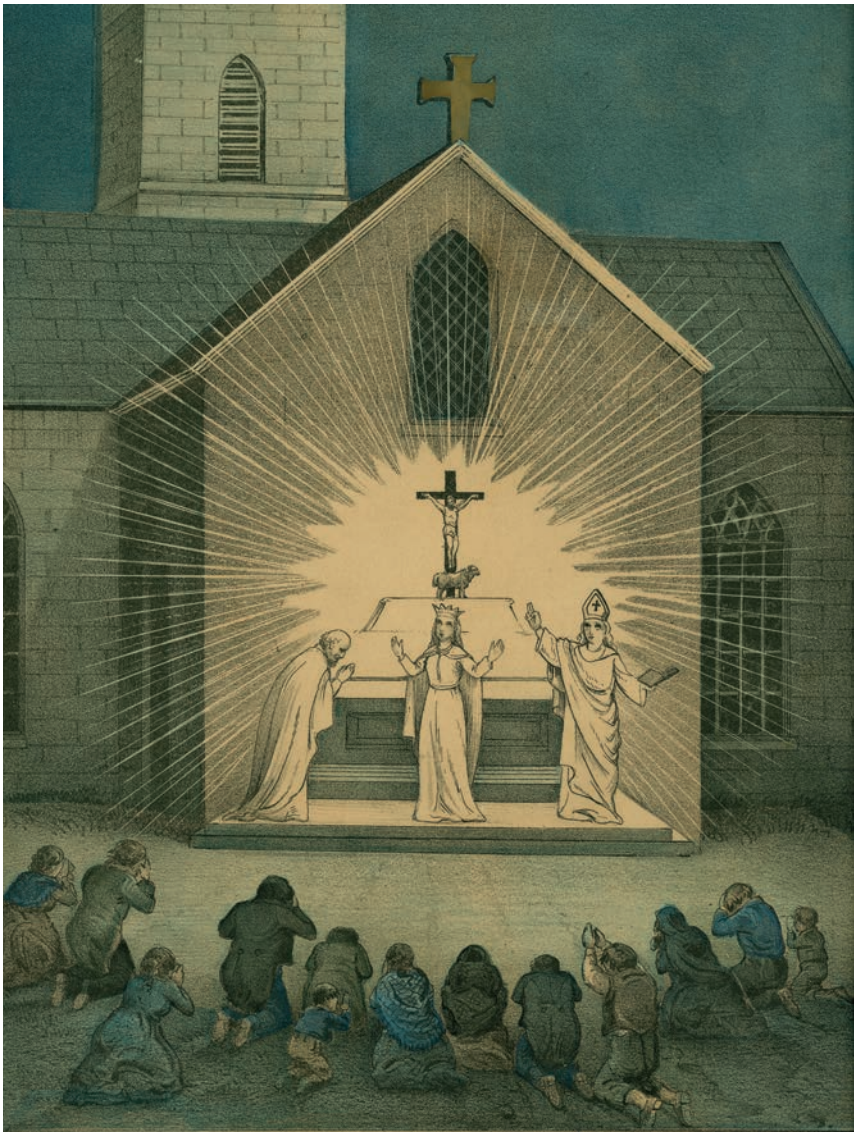

Figure 1. "Our Lady of Knock," a hand-colored lithograph by Courier and Ives depicting a scene that "miraculously" appeared on a church wall at Knock, Ireland, in 1879. (Author's collection)

### The Event

The caption of the Currier and Ives print (dating from 1879–1886[1]) reads as follows:

> OUR LADY OF KNOCK.
>
> On the evening of August 21st 1879 on the outer gable wall of the Sacristy of the Catholic Church in the Village of Knock, County Mayo, Ireland, was seen an extraordinary light in the midst of which appeared the Blessed Virgin, St. Joseph and St. John the Evangelist. Behind them an Altar on which stood a Lamb and above it the Crucifix with the figure of our Lord upon it. The people soon gathered at the spot gazing rapturously on the Heavenly Vision. And crowds now visit the scene of the wonderful apparition bringing many lame and blind who by touching the structure have been miraculously cured and restored to sight.

Unlike the usual apparitions reported by lone "visionaries" (typically persons with fantasy-prone personalities [Nickell 2013, 281–282]), in which the inner vision is described to others who did not see it, the occurrence at Knock was quite

different, having multiple viewers. It did, however, begin with a single witness, a young woman named Margaret Beirne who was making her daily visit to lock the doors of the village church. About 7 PM, she noticed a strange brightness that illuminated the top of the church. She gave it little thought, but half an hour later another woman, Mary McLaughlin, had a profound experience. Passing by, she saw within the glow—seeming to emanate from the church's southern gable—the "tableau" of holy figures already described; however, the figures were standing on the left, not as depicted in the lithograph.

There are serious discrepancies in what the fifteen or so witnesses did actually see. Some mentioned a cross or crucifix while others specifically insisted they had not seen this. Likewise, at least one witness did not see a lamb, and two boys alone saw flying angels. One figure—although described by some as a bishop wearing a miter—was seen, or later interpreted, as St. John the Evangelist. Nevertheless, there was general agreement as to the scene, but it was essentially the same as depicted in various holy pictures and a stained glass window in the nearby village of Ballyhaunis. Such images may well have influenced the perceptions of witnesses as well as their later memories.

Reportedly, while an inquiry was being conducted into the first occurrence, "another apparition took place on January 6, 1880, followed by two more on February 10th and 12th of the same year." Again, there were multiple witnesses and "The visions remained identical" each time (Aradi 1954, 101). A different view comes from another source ("Knock" 2015): "Apparitions of lights on the gable and even of the Virgin herself were seen after the vision but the church dismissed those stories." There is no official record of the later phenomena ("Knock Shrine" 2015).

In any event, in the original mysterious tableau according to Margaret Beirne's sister Mary, the Virgin was "life-size, the others apparently not so big or not so tall" (qtd. in Mullen 1998, 99). For some two hours the faithful watched the "apparition" in the falling rain, while the figures in the tableau remained unmoving and unspeaking (except, apparently for the one early sudden movement reported by two of the earliest witnesses [Rogo 1982, 218]). Indeed, Mary McLaughlin first thought the three figures were actual churchyard statues (perhaps, she thought mistakenly, replacements for those destroyed recently in a storm) (Mullen 1998, 99). One skeptic huffed that the experiencers "saw an apparition of statues!" ("Knock" 2015).

### Apparition vs. Illusion

The ability to see pictures in random forms—as in clouds, tea leaves, and inkblots—is known as *pareidolia*; the images themselves are called *simulacra*. Some publicized examples I have made pilgrimages to to examine include the face of Jesus in the skillet burns of a tortilla; the figure of Mary in the iridescent stain on a window (caused by water deposits from a sprinkler); the Madonna cradling the infant Jesus, in another window stain; and Jesus emerging from his tomb in a church's patterned marble. (See my "Rorschach Icons," Nickell 2007, 18–26.)

At Knock, the various elements—the multiple viewers, the unusual light, the immobility of the scene, the mismatched size of the figures, and the duration of the phenomenon—all suggest some type of optical illusion, probably involving pareidolia. Such illusions are known. In August 1986, for example, a Catholic woman reported seeing an illuminated image of Jesus, with his hand on the shoulder of a young boy, on a Fostoria, Ohio, soybean oil tank. Other believers saw the image, while nonbelievers tended to see nothing. As spokesman for the tank's owner, the Archer Daniel Midland Company, explained the image as "a combination of lighting, rust spots, fog, and people's imaginations" (qtd. in Nickell 1993, 36).

Another illusion occurred at Santa Fe Springs, California, in 1981. A couple saw on their garage door in the evenings the head of Christ crowned with thorns surmounting a cross. As it turned out, the effect was caused by the combined shadows of a real estate sign and a nearby bush, which were cast by a pair of street lamps (Nickell 1993, 28).

### 'Explanations'

Many have tried to explain the phenomenon at Knock—first, of course, as supernatural. But like other such claims, it is based on a logical fallacy called an argument from ignorance: "No one can explain it, therefore, it must have been a miracle," they say. In fact, one cannot draw a conclusion from a lack of knowledge. Substitute "X-force" for "miracle," and we see what a non-explanation it is.

Skeptics have not done so well either. One proposal is that it was pure suggestion: Mary Beirne, who saw a strange light, was the first to "identify" the figure of the Virgin Mary and quickly adopted a leadership position; she then influenced the others. In part, this no doubt happened, but it is unlikely as a complete explanation. Others have suggested a hoax, that, for instance, luminous-painted canvas cutouts were secretly hung on the wall; however, this can hardly be taken seriously. Another suggestion has been the use of a magic lantern, say hidden in a nearby school; or perhaps an altar-shaped box was temporarily attached to the wall itself, which "concealed the magic lantern and mirrors required to make the image" ("Knock" 2015). But could there be a simpler, natural explanation?

We have already considered some clues as to what might have happened. There are more. The gable wall was enveloped in the "eerie light" during the entire event, while rain continued to fall. Moreover, "The whole tableau seemed to stand out from the gable wall and to float about a foot and a half above the ground." Yet the apparitions, continues Rogo, "were obviously ephemeral" (1982, 219). One old woman said she went up "to kiss, as I thought the feet of the Blessed Virgin; but I felt nothing in the embrace but the wall, and I wondered why I could not feel with my hands the figures I had so plainly and so distinctly seen" (quoted in "Knock Shrine" 2015).

### The Mysterious Light

The light was first noticed illuminating the top of the church, and then seen to emanate from the south gable (Rogo 1982, 218). It was not uniform, since

even a monochromatic (one-color) picture must have tonal values (lights and darks) to form shapes. (Think of an ordinary black-and-white or sepia-tone photograph.) Mary Beirne first said the Virgin's cloak was "of white color" and the crown rather yellow (Mullen 1989, 99; "Knock" 2015). Whether the light "flickered" (Aradi 1954, 101) or portions "glimmered" (Rogo 1982, 218) or they did not ("Knock Shrine" 2015) is contradictorily stated. Whether there might have been shadow effects is also unknown. Mary Beirne saw stars that were "gold" (i.e., a deeper yellow) around the Lamb. "She admitted that the stars seemed to be *caused by reflection*" ("Knock" 2015; emphasis added).

But what was the source of the light? I consulted my colleague James McGaha, director of the Grasslands Observatory in Arizona. He made a computer recreation of the sky at the place, date, and time[2] of the "miracle," and discovered that the evening sun, coming from due west (270°) was above the horizon for the duration of the miracle. Moreover, not far from the church had been a school (shown in an 1879 survey of the area ["Knock" 2015]); it stood to the southeast, its eastern wall angled toward the church's south gable.

What is suggested is a natural version of a magic-lantern effect. Indeed, with the sun as a light source, an illusion was created with "smoke and mirrors"—or rather, rainy mist and reflective windows.[3] Such effects are documented. For example, diffuse reflections from windows, projected onto the wall of a nearby building, have been photographed. (See Minnaert 1993, 17.) These odd shapes could produce the requisite pareidolia (pictures-in-randomness) effects in susceptible individuals, especially those who were motivated to see something "miraculous" and were familiar with similar holy pictures.

McGaha stresses that while other scenarios are conceivable, the conditions that were apparently operative at Knock were ideal for producing such an optical illusion. His calculations show that "The angular relationship between the school wall and the chapel wall perfectly matches an angle of incidence to an angle of reflection, in relation to the azimuth of the sun."

Although rain clouds overhead would have darkened the sky, the setting sun could—and rather obviously did—serve as the light source. And everyone has seen strange lighting effects caused by the sun—sometimes shining while rain is falling. Rainy mist in front of the church wall probably played a significant role in the tableau illusion. The reflected images could have been projected in part onto such diaphanous mist, helping create the illusion that—as reported—the "figures" stood away from the wall, seeming "always just beyond reach" (Mullen 1998, 100), yet proving entirely without substance when one tried to grasp them.

The mystery light lasted—like the sun's light—from before the time the first witnesses noticed it until after everyone had left. They went to see about an old woman who, having been left alone, got out of her sickbed to try to see the vision and collapsed. After a few returned to the site some ten or fifteen minutes later, the lighted vision had vanished ("Knock" 2015). So, of course, had the sun.

## The Healings

An enterprising archdeacon worked the following morning to bottle rainwater that had flowed down the gable and use it to create holy water with supposedly curative powers ("Knock" 2015). People came to be healed, and "Knock soon became celebrated as one of the great Marian shrines" (Aradi 1954, 102). Unfortunately, the zealous were so intent on breaking pieces of cement from the church wall—for their supposedly curative power—that the wall became in danger of collapsing ("Knock" 2015).

As to the "miracle" cures at Knock, these are typically based, again, on the illogic of arguing from ignorance. Moreover, healings may be attributed—like such claims elsewhere—to misdiagnosis, psychosomatic conditions, spontaneous remission, prior medical treatment, the body's own healing power, and other effects, including exaggeration and even outright hoaxing.

With tragic irony, some people have been harmed rather than healed at Knock. Certain of the faithful were apparently persuaded by the predictions of self-proclaimed mystic Joe Coleman from Dublin that there would be a Miracle of the Sun like that reported in Fatima, Portugal, in 1917. In 2009, many people reported observing such phenomena at Knock, but unfortunately there was a correlation with a spike in cases of retinal damage. As an ophthalmologist explained, the "dancing" sun and other effects were merely visual disturbances due to staring at the sun, which can cause reduced sight and a condition called "metamorphopsia," or distorted vision ("Knock Shrine" 2015; *Taber's* 2001, 1286; Nickell 1993, 176–181). It may be wondered, then, whether any miracle has ever occurred at Knock. ■


### Acknowledgments

Thanks to James McGaha for his expert analysis of the conditions at Knock. Thanks also to Melissa Braun and CFI Libraries Director Tim Binga.


### Notes

1. From 1876–1886, Currier and Ives were located at the address—115 Nassau St.—given on the print (Kovel and Kovel 1973, 242).

2. The times given in the account were local time, here assumed to be one hour after that of Greenwich mean solar time.

3. We infer the likely presence of windows in the long sides of the school building. If they were not present, we would still postulate the sun obliquely hitting the church wall directly, with other scenarios for the random, diffuse forms.

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## [ A MAGICIAN IN THE LAB JAMES RANDI

James Randi began his career as a stage magician and escape artist but achieved fame as a professional skeptic, disproving the claims of self-described psychics, mind readers, and faith healers. He is a founder of the Committee for Skeptical Inquiry (formerly CSICOP). This is the first of a new regular column.

# The Dangerous Delusion about Vaccines and Autism

Hello again! I begin my joyful return to the pages of the "Magazine for Science and Reason" at the age of eighty-eight. Yes, I've slowed down in some ways but have embraced medical science enthusiastically, as it permits me to continue well past the average life span attained by the average male. Our esteemed editor Ken Frazier has set limits on how much I write in this new column for the Skeptical Inquirer, but not upon what subjects I may choose to pontificate. Joy! Here goes. . . .

What follows here is about one very important subject of my next book—my eleventh—*A Magician in the Laboratory*, already written and seeking publication. If there is one major concern that has taken my attention as a skeptic and served to inspire this book, it is the persistent and currently very popular delusion that tries to connect the process of childhood vaccination with the dreaded condition known as autism. I've personally known two families plagued with autism.

The most erroneous and damaging misunderstanding about this condition started in 1998, when a British researcher, Dr. Andrew Wakefield, published in the prominent medical journal *The Lancet* a paper claiming that there was a connection between the use of MMR—a multi-purpose immunization vaccine used against measles, mumps, and rubella (German measles)—and the onset of autism in children. This is simply not true. MMR has been found to be a very effective prophylactic measure, and since the 1970s, well over 500 million doses have been successfully administered worldwide in some sixty countries.

Andrew Wakefield

Wakefield received $780,000 for his consulting services on that project. . . .

Then, in 2010, that *Lancet* paper by Wakefield was officially retracted upon the discovery of serious overlooked basic flaws in his protocol and the unethically close connection between the author of the paper and the industrial agencies that had financed his work. That, however, did little to assuage the fears of some parents who were by then very convinced that the MMR vaccine had caused their children to become crippled by autism. Part of that parental reluctance to accept the findings may well have been that several investigators postulated that autism might really be the result of hereditary factors, a possibility that those parents understandably preferred not to face.

The symptoms of this still-mysterious condition are highly variable and appear in different degrees in different individuals. My own personal and extended experience with autistic children occurred when, following a direct request from the University of Syracuse, I looked into the farce known as "Facilitated Communication" (FC). The resulting experience was most unpleasant, with little cooperation being offered me by those administering this blatant quackery.

FC consists of the "facilitator"—most often a young woman—holding the hand of an autistic child with the child's index finger extended, hovering over a computer keyboard, and guiding that finger while pressing it against selected keys so as to spell out messages that are said to originate from the child. Wrong. That child seldom even *looks* toward the keyboard, is often wriggling, kicking, and looking away, or even *dozing off*, though the facilitator's attention

is seen to be very concentrated, often looking ahead to the next letter of the word being spelled out! Consult the subject under Facilitated Communication on the Internet, and you will see this farce as I've just described it. The staff at Syracuse had actually come to believe that these children might be using *telepathy*, and had called me in to find out if that might be the correct solution!

Please understand: most autistic kids have problems establishing eye-to-eye contact and will display bizarre facial expressions and strange body postures. They seem unable or unwilling to share enjoyment or interests with others, and they do not relate to the discomfort of others. About half of them do not speak well, using wails or repetitive loud noises or words to express themselves. They have very poor skills at maintaining communication, and often exhibit echolalia (seizing upon a verbal phrase or expression that captures their attention and repeating it endlessly). Some will choose a shiny object or a bright light and fixate on it. Others will constantly rock their bodies and/or flap their hands. As for the degrees of these behavior patterns they exhibit, I found that it varied from extreme—wild shouting and damaging bouts of flailing with arms and legs—to gentle, distant, and almost acceptable demeanors and attitudes.

*The Lancet* found that Dr. Wakefield had changed and misreported results in his research. Medical documents and subsequent interviews with witnesses have since established that he manipulated patients' data, thereby triggering fears that use of the MMR triple vaccine was linked to the condition. They found that the families of eight out of twelve children attending a routine clinic at the hospital had blamed MMR for their autism and said that problems came on within a few days of the injection. However, as confirmed by evidence presented to the U.K. General Medical Council (GMC), most of the twelve children's ailments as described in *The Lancet* differed substantially from their hospital and medical records. Though the research paper had claimed that autistic symptoms were detected within days of the injection, thus implying a temporal connection, *in only one case* did records suggest that this was true, and in many of the other cases, pertinent medical concerns about MMR had been raised *before the children had even been vaccinated*! After the publication, rates of inoculation fell dangerously low, from 92 percent to below 80 percent.

**Populations acquire what's known as "herd immunity" from diseases such as measles—as well as from mumps and rubella—when more than 95 percent of the local population has been vaccinated because the percentage of carriers of such infectious diseases is thereby kept below a sustainable spread ratio.**

Populations acquire what's known as "herd immunity" from diseases such as measles—as well as from mumps and rubella—when more than 95 percent of the local population has been vaccinated because the percentage of carriers of such infectious diseases is thereby kept below a sustainable spread ratio. Early in 2010, official figures showed that 1,348 confirmed cases of measles in England and Wales were reported that year compared with only fifty-six back in 1998. Two children died of the disease.

Even before *The Lancet*'s withdrawal of the paper, ten of Wakefield's coauthors had their names removed from authorship.

The U.S. Centers for Disease Control and Prevention of course shares (along with parents and many others) great concern about the number of children with autism spectrum disorders (ASD) and is still trying to understand what causes autism, how it can be prevented, and how it can be recognized and treated as early as possible. Estimates are that one in 120 of eight-year-olds had ASD, then in 2012 that figure had jumped to about one in eighty-eight, an estimate which is higher than estimates from the early 1990s. This is a seriously frightening figure.

A preservative, thimerosal, used in vaccines has induced much terror from the uninformed. It's a compound that contains the element mercury—you know, the liquid metal that you played with in chemistry class, those little silver beads. Yes, mercury can be poisonous, but only when consumed or combined into a compound. Consider: common table salt is sodium chloride—chemical formula NaCl—which we all consume every day, but sodium all by itself is a soft silvery metal that converts into a very highly caustic and poisonous compound when it comes into contact with water, yet it's 100 percent safe—as salt. Chemically, thimerosal is $C_9H_9HgNaO_2S$, a far more complicated compound.

There are two very different types of mercury in compounds that you should know about. These are methylmercury ($CH_3Hg$) and ethylmercury ($C_2H_5Hg$), and they are quite distinct from one another. Mercury itself is

found everywhere in the Earth's crust, air, soil, and water. Certain types of bacteria in the environment can change natural mercury into the methylmercury variety, which can be *very* toxic to humans, but thimerosal contains the very different form of mercury—ethylmercury—which is broken down and excreted from the body rapidly after being administered, so the type of mercury found in the influenza vaccine is far less likely to accumulate in the body and cause harm. A very, very tiny amount of thimerosal serves to preserve vaccines to avoid the possible growth of bacteria and fungi in case they get into the vaccine—which could occur when a syringe needle enters a vial just as the vaccine is being prepared for administration. Contamination by certain germs in a vaccine could cause severe local reactions, serious illness, or even death.

Be assured, the vaccine preservative thimerosal has a proven track record of being very safe. The most common side effects can be very minor reactions such as redness and swelling at the injection site. *Research does not show any link between (a) thimerosal in vaccines and (b) autism.* In any case, use of thimerosal was discontinued in childhood vaccines in 2001, yet recent reports of autism have gone up dramatically, which is quite the opposite of what would be expected if thimerosal caused autism. Also, the MMR vaccine—specifically blamed for autism by the uninformed, remember—does not, and never did, contain thimerosal, nor did vaccines for varicella (chickenpox), inactivated polio (IPV), and pneumococcal conjugate (a meningitis source), ever contain thimerosal.

Anti-vaxxers—those who embrace the misguided notion that vaccines administered to children are a major public health threat and/or that this practice causes autism—are misguided people who are generally well-intentioned but still badly mistaken. They may mean well, and in fact many have autistic children themselves, a fact that may have prompted them to become involved in the controversy. But if they are successful in preaching their fears, many, many children will die of totally preventable diseases. As I mentioned earlier, we're already seeing a comeback of measles due to drops in vaccination rates. This is no far-flung future; these terrible consequences of antiscientific nonsense are happening to us right now. For most in the medical community, this issue is now closed.

But why do so many people continue to believe that there is a link, despite the overwhelming evidence? The answer is something that has more credibility than the best scientific study: personal experience. Here we encounter a basic error in logic that folks often make. Many parents came to believe that vaccines caused their children's autism because the symptoms of autism appeared shortly after the child received a vaccination. On a psychological level, that assumption and connection seems to make sense, but on a logical level, it is a clear and common fallacy: *post hoc ergo propter hoc*—"[It happened] after this, therefore because of this."

I trust that my reader can understand my concern over this MMR farce, and I offer encouragement to concerned parents. Louis Pasteur's vaccines have saved countless lives all over the world and hopefully will continue to do so. ■

Robert Sheaffer has been writing the "Psychic Vibrations" column in Skeptical Inquirer for forty years. He has decided it is time to retire this column. He still blogs at www.BadUFOs.com.

# 'UFO Disclosure' Fizzles Again in 2016

We recently reported ("'UFO Disclosure' Happening Again This Year," September/October 2016) about the excitement being generated by rumors of imminent "UFO Disclosure." John Podesta, Hillary Clinton's campaign manager, is widely known to be a believer in UFOs and aliens. With the expectation of Clinton's victory, lobbyist Steven Bassett of Paradigm Research Group (PRG) proclaimed that UFO disclosure "will be a reality this year and across the front pages of newspapers across the world."

But Clinton was not elected, and activists scrambled to recover some scraps of hope that their longed-for revelations might still occur. Bassett wrote on November 17:

> Two days after the election defeat of Secretary Hillary Clinton Paradigm Research Group received a message from a source within the military/intelligence community known to PRG. The message paraphrased is this: persons who are directly involved in the management of the extraterrestrial issues want Disclosure to take place under President Obama and are ready to work with the SecDef if approached. . . . The Clintons now have a choice to make of historic proportions. Should they immediately take interviews with top journalists and discuss in greater detail what they know about the ET issue and what transpired during the Rockefeller Initiative (1993–1996), the resulting media storm will force the Pentagon and the White House to reach the necessary understanding allowing Barack Obama to be the Disclosure president. Or should they remain silent and allow the truth embargo to continue on into the next administration. (http://tinyurl.com/3oktofa)

The PRG's website says that, as of this writing, "There are 54 days left for Secretary Clinton and John Podesta to engage the media on the extraterrestrial issue forcing an agreement between the White House and the Pentagon for Disclosure under President Obama." By the time you read this, that time will be up.

* * *

Folks in Roswell, New Mexico, are preparing for a "hot time" this coming summer. For a number of years, each July the Roswell UFO Museum has sponsored a UFO Festival with speakers, vendors, alien costumes, etc., and this year will be no different. The theme of this year's festival is "70 Years Later: Modern Challenges to the Extraterrestrial Hypothesis," which at first sounds surprisingly skeptical. Except that in this case non-ET explanations apparently involve claims that are perhaps equally dubious. One speaker is Nick Redfern, who claims that reported sightings of little bodies in the desert actually involved captured Japanese pilots who were flown in on some bizarre kind of craft.

However, longtime Roswell researcher Kevin Randle wrote in his new book *Roswell in the 21st Century* that over the years he had personally interviewed all eight of the people who claimed to have seen small bodies from an alleged Roswell UFO crash, and "not one" of them turned out to be telling the truth. Thus Redfern's bizarre speculation seems to be an implausible theory in search of something to explain. Other speakers and former speakers at the festival tell of supposed MILABS, or "military abductions"—citizens being stealthily "abducted" by the U.S. military in the manner of supposed UFO aliens, for unknown purposes. This is not exactly a "skeptical" view of the Roswell controversy.

But this year there will be a rival event. The town's newspaper, the *Roswell Daily Record*, is sponsoring an event named "The Roswell Incident," running from Friday, June 30 to Sunday, July 2. This is a special event to commemorate the seventieth anniversary. (Randle notes that there were two parallel conferences in Roswell during the fiftieth anniversary celebration in 1997, but back then there were two UFO museums.) Among this year's speakers will be Nick Pope, Lee Speigel, Alejandro Rojas, and Race Hobbs. Will there be enough eager conference-goers to successfully fund both events? Will these two groups be able to coexist without feuding? (I'm told that relations between them are quite cordial, even cooperative, at least so far.) And more importantly, will anybody at either of these conferences come up with any credible new information about the Roswell incident that has any significance? Or will it be just more of the same old, same old: extraordinary claims with little or no proof?

I was a guest on Kevin Randle's radio show broadcast December 17, 2016 (http://goo.gl/le3vpk). I asked him whether it was true that in his newest book he had "recanted," as had been reported, his earlier strong support for the Roswell incident as an extraterrestrial event. He replied that he was no longer sure what actually happened, and that he feels the case for ET involvement is no longer robust. After meticulously investigating Roswell claims and stories over four decades, Randle realized that there are too many weak spots in the fabric to make a credible case for an ET crash, and he was brave enough to admit it.

Meanwhile, MUFON recently issued a statement that "We are pleased to announce the 2017 MUFON Symposium July 21–23, at the beautiful JW Marriott in Las Vegas, NV. Our Theme will be 'The Case for a Secret Space Program.'" A "secret space program" means that we have spaceships zipping all around the solar system and according to some even farther afield—all in complete secrecy! The announcement is accompanied by a graphic of a huge space fortress, apparently in low Earth orbit. Such a thing, if it existed, would often be as bright as Venus seen from the ground. Amateur astronomers have photographed the International Space Station clearly enough to reveal its shape, so where is the photographic evidence for "secret space stations"?

* * *

Finally, after writing this "Psychic Vibrations" column for just under forty years (since the Fall/Winter 1977 issue of what was then called *The Zetetic*), it is time for me to retire the column. It has been a very good run. We have covered many entertaining subjects, striving to be both entertaining and educational, but it is now time for me to move on. If you want to read more of these columns, there is a book of *Psychic Vibrations*—see my blog. My newest book, *Bad UFOs*, contains up-to-date information about many well-known UFO incidents and claims. I am still blogging at www.BadUFOs.com, covering ongoing developments in UFOlogy and encouraging informed discussion of the controversy from any perspective. I hope some of you will check it out.

Stay skeptical!

## [ SCIENCE WATCH

KENNETH W. KRAUSE

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# The Delectable Myths of Healthy and Health*ier* Obesity

*Why, sometimes I've believed as many as six impossible things before breakfast.*

—The Queen to Alice in *Through the Looking Glass*

Wouldn't it be splendid to have our cakes and eat them too? Arguably, both ideology and popular culture allow their followers to do just that. Until they don't, of course. At that point, when facts and logic can no longer be denied, the rudely awakened find themselves confronted with difficult choices.

The concept of healthy obesity, for example, has gained much traction during the past fifteen years. At one end of the continuum, members of the popular but clearly flawed "Healthy at Every Size (HAES)" movement profess the nonexistence of excess adiposity and suggest that even the most obese people can lead perfectly healthy lives ("*Every* size"—really?). On the other end, and somewhat more credibly, others allege the existence of an "obesity paradox" and a "metabolically healthy obesity." Such are the tantalizing subjects of this column.

Cardiologist and obesity researcher Carl J. Lavie has described the paradox as follows: "Overweight and moderately obese patients with certain chronic diseases . . . often live longer and fare better than normal-weight patients with the same ailments" (Lavie 2014). In addition to his own research, Lavie's conclusions are based on a revolutionary (and, in some circles, much-celebrated) *Journal of the American Medical Association* study led by Katherine Flegal at the U.S. Centers for Disease Control and Prevention, who reviewed ninety-seven studies of more than 2.88 million individuals to calculate all-cause mortality hazard ratios for standard body mass index (BMI) classifications (Flegal et al. 2013).

Flegal's team concluded that relative to normal weight, all combined grades of obesity were associated with an 18 percent higher incidence of all-cause

mortality. In cases of more extreme obesity, the association rose to 29 percent. By itself, however, the mildest grade of obesity was not correlated with a significantly elevated risk, and the overweight but not obese category was actually associated with a 6 percent *lower* incidence of all-cause mortality. Predictably, the popular media quickly seized on the overweight population's presumed appetite for these tempting results.

Metabolically healthy, or "benign," obesity, on the other hand—which Lavie dubs the "ultimate paradox"—appears to have no standard definition or list of qualifying criteria but is often characterized generally as "obesity without the presence of metabolic diseases such as type 2 diabetes, dyslipidemia, or hypertension" (Munoz-Garach et al. 2016). The hallmark trait of this subpopulation, however, is retained insulin sensitivity. Researchers have assigned up to 32 percent of the obese population to this phenotype. It applies more prevalently to women than men but is thought to decrease with age among both sexes. Researchers have yet to determine whether these obese are genetically predisposed to decreased risks of disease or mortality. But their existence, along with that of the metabolically unhealthy normal-weight population, suggests that factors other than excess adiposity are at play.

All of which might sound at least somewhat comforting to the now 600 million obese worldwide (and still growing) who have been told for decades that obesity *per se* will significantly increase one's susceptibility to heart disease, stroke, cancer, diabetes, and arthritis, for example. Preferences and popular reports aside, however, it appears we may yet be forced to choose between possessing our cakes and consuming them, because an impressive body of new and well-conceived research has called both the paradox and healthy obesity into serious question.

Consider, for example, a truly enormous international meta-analysis published last July in *The Lancet* by the Global BMI Mortality Collaboration (2016). Led by Harvard professor of nutrition and epidemiology Frank Hu, this study pored over data from more than 10.6 million participants who were followed for up to fourteen years. Included were 239 large studies conducted in thirty-two countries. Importantly, the Collaboration attempted to control for a "reverse causation bias," in which low BMI was the result, rather than the cause, of an underlying or preclinical illness by excluding current or former smokers, those who suffered from chronic disease at the study's inception, and those who died during the initial five years of follow-up. In other words, Hu's team addressed the potential for potent confounders that Flegal's team, for lack of data, was forced to ignore.

The Collaboration's results were startling. Interestingly, Hu "was able to reproduce [Flegal's results] when conducting crude analyses with inadequate control of reverse causality, but not when [he] conducted appropriately strict analyses." In the end, then, the Collaboration found that, worldwide, participants with a normal BMI in the 22.5 to 25 range enjoyed the lowest risk of mortality and that such risk increased significantly throughout the overweight and obese ranges. In fact, every five units of BMI in excess of 25 was associated generally with a 31 percent greater risk of premature death—specifically, 49 percent for cardiovascular-related, 38 percent for respiratory-related, and 19 percent for cancer-related mortality. According to Hu, his team had succeeded in "challeng[ing] previous suggestions that overweight and grade 1 obesity are not associated with higher mortality, bypassing speculations about hypothetical protective metabolic effects of increased body fat in apparently healthy individuals."

Consider also a large prospective cohort study published last October in the *BMJ* in which about 115,000 participants—free of cardiovascular disease and cancer at baseline—were followed for up to thirty-two years (Veronese et al. 2016). Evaluating the combined associations of diet, exercise, alcohol consumption, and smoking with BMI on the risk of all-cause and cause-specific mortality, this study was also designed to address Flegal's peculiar 2013 results. A lead author here as well, Frank Hu first noted, once again, that previous examinations suggesting an obesity paradox, including Flegal's, had allowed for potentially confounding bias by failing to distinguish between healthy normal-weight individuals and a "substantial proportion of the US population" in which "leanness is driven by other factors that can increase risk of mortality," including existing or preclinical chronic diseases and smoking.

Contrary to the alleged paradox, Hu discovered that when lifestyle factors were taken into serious consideration, the lowest risk of all-cause and cardiovascular mortality was enjoyed by participants in the normal 18.5 to 22.4 BMI range—that is, when those subjects also displayed at least three out of four healthy lifestyle factors, including healthy eating, adequate exercise, moderate alcohol intake, and no smoking.

In the end, according to Hu's team, "the U-shaped relation between BMI and mortality observed in many epidemiological studies is driven by an over-representation in our societies of individuals who are lean because of chronic metabolic and pathological conditions caused by exposure to smoking, a sedentary lifestyle, and/or unhealthy diets." The optimal human condition, in other words, is not overweight of any kind or to any degree but rather "leanness induced by healthy lifestyles."

So much for the obesity paradox, at least for now. But what of its somewhat less voracious cousin, the notion of metabolically healthy obesity?

Recognizing prior support for so-called "benign obesity," a trio of Canadian diabetes researchers led by Caroline Kramer conducted a systematic review and meta-analysis of eight studies evaluating over 61,000 subjects—many of whom were classified as metabolically healthy obese—for all-cause mortality and cardiovascular events (Kramer et al. 2013). When all studies were considered, regardless of follow-up duration, the healthy obese subjects displayed risks similar to those of healthy normal-weight participants. However, when considering only those studies that followed-up for at least ten years, Kramer and colleagues discovered that the purportedly healthy obese were significantly more likely than their normal counterparts to perish or suffer serious cardiovascular trouble.

Should we infer, then, that the healthy obese are, in fact, healthy until circumstances render them otherwise a decade later? Not according to Kramer. Regardless of metabolic status, she warned, even in the short term, obesity is associated with subclinical vascular disease, left-ventricular abnormalities, chronic inflammation, and increased carotid artery intima-media thickness, and coronary calcification. In the end, the Canadians found no support for the "benign obesity" phenotype and declared with no uncertainty that "there is no 'healthy' pattern of obesity."

Most recently, however, a diverse and impressively creative group of Swedish scientists used transcriptomic profiling in white adipose tissue to contrast responses to insulin stimulation between never-obese, unhealthy obese, and, again, supposedly healthy obese subjects (Ryden et al. 2016). Led by Mikael Ryden at the Karolinska Institutet, this group revealed, first, clear distinctions between the never-obese and both groups of obese participants, and, second, *nearly identical and abnormal* patterns of gene expression among both insulin-resistant and insulin-sensitive obese subjects, independent of other cardiovascular or metabolic risk factors.

**Obese or not, our health continues to be undermined by the popular, emotion-manipulating media, the misguided and oppressive forces of political correctness forbidding full candor, and, most crucially, our own subjective prejudices and appetites.**

Said Ryden during a post-publication interview: "Insulin-sensitive obese individuals may not be as metabolically healthy as previously believed" (ScienceDaily 2016). His team's findings, he continued, "suggest that vigorous interventions may be necessary for all obese individuals, even those previously considered . . . healthy."

To Lavie's credit, he generally acknowledges obesity's proven hazards. He also recognizes serious and consistent exercise as the most reliable strategy for attaining and maintaining good health. Far less defensible, however, is Lavie's insistence that exercise can render obesity a benign condition. First, as much of the research presented here demonstrates, the chronic diseases strongly associated with obesity are, by definition, progressive and apt to cause damage down the road. Second, for practical reasons in the real world, excess adiposity always makes meaningful exercise a far more difficult (and thus far less likely) endeavor.

Obese or not, our health continues to be undermined by the popular, emotion-manipulating media, the misguided and oppressive forces of political correctness forbidding full candor, and, most crucially, our own subjective prejudices and appetites. But as their numbers continue to swell, the overweight and obese grow increasingly vulnerable to seductive messages inviting self-deception and failure. As in all other contexts, their liberation from these influences derives only from an unflinching appreciation for the methods of science—that is, empiricism, rationality, candor, and the assumption of responsibility for individual experimentation. In a word, *skepticism*.

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**[ SKEPTICAL INQUIREE** BENJAMIN RADFORD

Benjamin Radford is a research fellow at the Committee for Skeptical Inquiry and author or coauthor of ten books, including *Bad Clowns*.

# Mystery of the Paulding Light

**Q:** **What do you know about the mysterious "Paulding Light" reported in Michigan? Any idea what it is?**

**—A. Onion**

**A:** Mystery buffs in Michigan's Upper Peninsula often seek out a lonely road at a remote spot in the woods near the Wisconsin border hoping to see a mystery known as the "Paulding Light." Some come prepared with bug spray and beer, while others arrive empty-handed. All, however, harbor hopes of seeing the mystery for themselves. Lights such as those seen in the Upper Peninsula are often referred to as ghost lights or spook lights.

Some traditions link floating lights with death—accounts from centuries ago suggest that if a person saw three distinct unknown lights in the sky, it was an omen that three deaths should be expected soon. Though such superstitions are rarer today, the association between mysterious lights and ghosts or the supernatural lives on in folklore.

These lights are not merely encountered as factual, visible anomalies but instead often appear in the context of ghost stories. Local folklore provides a legendary "explanation" for the lights—part of a long tradition of creating narratives to explain natural celestial processes.

Fans explore and post videos of their experience, speculating endlessly about the light's origin. In the case of the Paulding Light, John Carlisle of *The Detroit Free Press* explains:

> Legend says the light comes from the swaying lantern held by the ghost of a railroad brakeman who died when he was crushed as he tried to stop an oncoming train from hitting railcars stalled on the tracks. This was logging country more than a century ago, and local residents say there were a number of railroads that ran through the forest and are now buried in the underbrush. Some believe it's the light of the train, which itself is now a ghost. Some claim it's the distraught spirit of a grandparent looking for a lost grandchild with a lantern that needs constant relighting, the reason the light seems to come and go. (Carlisle 2016)

Other places with similar reports include the Brown Mountain Lights of North Carolina (see Joe Nickell's column on the topic [Nickell 2016]), Missouri's Ozark Spooklight, and the Marfa lights near Marfa, Texas. There are many natural explanations for curious lights seen in the skies, and a single blanket explanation cannot account for them all. Instead, it depends on the specific circumstances of each location: some areas may contain groups of bioluminescent animals, including fireflies (which are in fact beetles); other locations may have types of fungus that emit light. Other explanations include aircraft lights, reflections from stars or planets distorted

through layers of different temperatures, and will-o-the-wisp—glowing swamp gas seen over marshes and wetland caused by the oxidation of decomposing organic matter. The lights are seen only under certain conditions and circumstances; many visitors wait in vain for hours and see nothing. Eyewitnesses to the same phenomena sometimes offer different descriptions of what they saw: some are said to briefly flicker in place; others are said to dance or shoot across the sky like a UFO.

The distant lights' fickle nature makes them difficult to fully investigate. Members of the SyFy television show *Fact or Faked: Paranormal Files*—for whom mundane curiosities and obvious camera artifacts are often characterized as eternally insoluble mysteries—tackled the Paulding Light case but, predictably, failed to solve the mystery and proclaimed it unexplainable.

However, Carlisle notes that in 2010 a team from Michigan Tech led by electrical engineering student Jeremy Bos

> brought a spectrograph and a telescope to the dead-end road, sent each other driving down the new highway while blinking their lights in a prearranged pattern, and recorded the results. Every time the light appeared, one look through the telescope showed what sure looked like the headlights of oncoming cars, which could be seen clearly through the lens, sometimes with the distinct outline of the car coming down the road, which is about 8 miles away. The group even shot a video through the telescope so others could see, and posted it online. The flickering, they said, was caused when cars went over a hill.

Some believers dismiss such explanations as far-fetched, acknowledging that while known light sources do exist in the direction of the lights and may account for a few reports, others would be too faint to be mistaken for the spook lights. Ordinarily that may be true, but under certain circumstances low clouds cannot only reflect but amplify ambient light from roadways and nearby towns. Indeed, Bos analyzed local atmospheric patterns and found that "Heat rising off the pavement may sometimes contribute to the light's distortion . . . [and] an inversion layer in the line of sight between the road and the Paulding Light viewing spot may also create very stable air, which could account for the light's visibility about four and a half miles from US-45" (Goodrich 2011).

It's very difficult to conclusively rule out all the possible known sources of light that could be mistaken for spook lights—automobile headlights, campfires, aircraft, cloud reflections of distant city or vehicle lights, insects, and so on—and inevitably some reports will remain unexplained. At the end of the day, of course, it's more fun to imagine the distant glimmer is a ghostly railroad brakeman's phantom lantern than the headlights of a 2005 Honda Civic. ■

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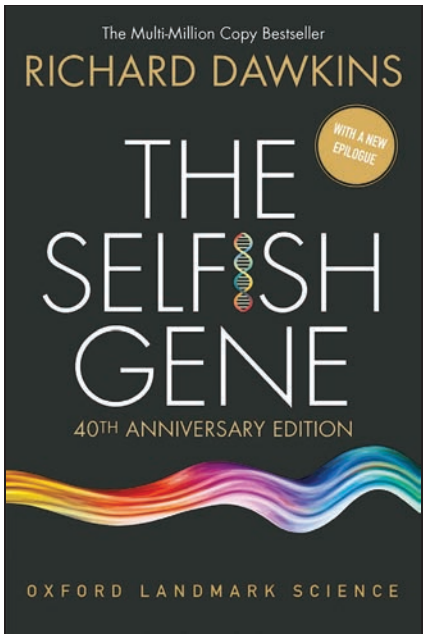
# THE SELFISH GENE REVISITED

RICHARD DAWKINS

On the fortieth anniversary of the book that made him a scientific celebrity, biologist Richard Dawkins looks back at this "gene's eye view" of evolution and finds it even more relevant today.




This article is the epilogue to *The Extended Selfish Gene* and the fortieth anniversary edition of *The Selfish Gene*, both published in 2016 by Oxford University Press. Copyright 2016. Reprinted by permission of Richard Dawkins and OUP.

Scientists, unlike politicians, can take pleasure in being wrong. A politician who changes his mind is accused of "flip-flopping." Tony Blair boasted that he had "not got a reverse gear." Scientists on the whole prefer to see their ideas vindicated, but an occasional reversal gains respect, especially when graciously acknowledged. I have never heard of a scientist being maligned as a flip-flopper.

In some ways I would quite like to find ways to recant the central message of *The Selfish Gene*. So many exciting things are fast happening in the world of genomics, it would seem almost inevitable—even tantalizing—that a book with the word "gene" in the title would, forty years on, need drastic revision if not outright discarding. This might indeed be so, were it not that "gene" in this book is used in a special sense, tailored to evolution rather than embryology. My definition is the population geneticists' definition adopted by George C. Williams, one of the acknowledged heroes of the book, now lost to us along with John Maynard Smith and Bill Hamilton: "A gene is defined as any portion of chromosomal material that potentially lasts for enough generations to serve as a unit of natural selection." I pushed it to a somewhat facetious conclusion: "To be strict, this book should be called . . . *The slightly selfish big bit of chromosome and the even more selfish little bit of chromosome.*" As opposed to the embryologist's concern with how genes affect phenotypes, we have here the neo-Darwinist's concern with changes in frequencies of entities in populations. Those entities are genes in the Williams sense (Williams later called that sense the "codex"). Genes can be counted and their frequency is the measure of their success. One of the central messages of this book is that the individual organism doesn't have this property. An organism has a frequency of one, and therefore cannot "serve as a unit of natural selection" (not in the same sense of *replicator* anyway). If the organism is a unit of natural selection, it is in the quite different sense of gene "vehicle." The measure of its success is the frequency of its genes in future generations, and the quantity it strives to maximize is what Hamilton defined as "inclusive fitness."

A gene achieves its numerical success in the population by virtue of its (phenotypic) effects on individual bodies. A successful gene is represented in many bodies over a long period of time. It helps those bodies to survive long enough to reproduce in the environment. But the environment means not just the external environment of the body—trees, water, predators, etc.—but also the internal environment, and especially the other genes with which the selfish gene shares a succession of bodies through the population and down the generations. It follows that natural selection favours genes that flourish in the company of other genes in the breeding population. Genes are indeed "selfish" in the sense promoted in this book. They are also *cooperative* with other genes with which they share, not just the present particular body, but bodies in general, generated by the species' gene pool. A sexually reproducing population is a cartel of mutually compatible, cooperating genes: cooperating today because they have flourished by cooperating through many generations of similar bodies in the ancestral past. The important point to understand (it is much misunderstood) is that the cooperativeness is favoured, not because a group of genes is naturally selected as a whole, but because individual genes are separately selected against the background of the other genes likely to be met in a body, and this means the other genes in the species' gene pool. The pool, that is, from which every individual of a sexually reproducing species draws its genes as a sample. The genes of the species (but not other species)

**A gene achieves its numerical success in the population by virtue of its (phenotypic) effects on individual bodies. A successful gene is represented in many bodies over a long period of time.**

are continually meeting each other—and cooperating with each other—in a succession of bodies.

We still don't really understand what drove the origin of sexual reproduction. But a consequence of sexual reproduction was the invention of *the species* as the habitat of cooperating cartels of mutually compatible genes. As explained in the chapter called "The Long Reach of the Gene," the key to the cooperation is that, in every generation, all the genes in a body share the same "bottlenecked" exit route to the future: the sperms or eggs in which they aspire to sail into the next generation. *The Cooperative Gene* would have been an equally appropriate title for this book, and the book itself would not have changed at all. I suspect that a whole lot of mistaken criticisms could have been avoided.

**Zero does *not* mean that the two individuals share no genes in common. All humans share more than 99 percent of our genes, more than 90 percent with a mouse, and three-quarters of our genes with a fish.**

Another good title would have been *The Immortal Gene*. As well as being more poetic than "selfish," "immortal" captures a key part of the book's argument. The high fidelity of DNA copying—mutations are rare—is essential to evolution by natural selection. High fidelity means that genes, in the form of exact informational copies, can survive for millions of years. Successful ones, that is. Unsuccessful ones, by definition, don't. The difference wouldn't be significant if the potential lifespan of a piece of genetic information was short anyway. To look at it another way, every living individual has been built, during its embryonic development, by genes which can trace their ancestry through a very large number of generations, in a very large number of individuals. Living animals have inherited the genes that helped huge numbers of ancestors to survive. That is why living animals have what it takes to survive—and reproduce. The details of what it takes vary from species to species—predator or prey, parasite or host, adapted to water or land, underground or forest canopy—but the general rule remains.

A central point of the book is the one developed by my friend the great Bill Hamilton, whose death I still mourn. Animals are expected to look after not only their own children but other genetic relatives. The simple way to express it, and the one that I favour, is Hamilton's Rule: a gene for altruism will spread if the cost to the altruist, *C*, is less than the value, *B*, to the beneficiary, devalued by the coefficient of relatedness, *r*, between them. *r* is a proportion between 0 and 1. It has the value 1 for identical twins; 0.5 for offspring and full siblings; 0.25 for grandchildren, half-siblings, and nieces; 0.125 for first cousins. But when is it zero? What is the meaning of zero on this scale? This is harder to say, but it is important and it was not fully spelled out in the first edition of *The Selfish Gene*. Zero does *not* mean that the two individuals share no genes in common. All humans share more than 99 percent of our genes, more than 90 percent with a mouse, and three-quarters of our genes with a fish. These high percentages have confused many people into misunderstanding kin selection, including some distinguished scientists. But those figures are not what is meant by *r*. Where *r* is 0.5 for my brother (say), it is zero for a *random member of the background population with whom I might be competing*. For purposes of theorizing about the evolution of altruism, *r* between first cousins is 0.125 only when compared to the reference background population ($r = 0$), which is the rest of the population to whom altruism potentially might have been shown: competitors for food and space, fellow travellers through time in the environment of the species. The 0.5 (0.125, etc.) refers to the *additional* relatedness *over and above* the background population, whose relatedness approaches zero.

Genes in the Williams sense are things you can count as the generations go by, and it doesn't matter what their molecular nature is; it doesn't matter, for instance, that they are split up into a series of "exons" (expressed) separated by mostly inert "introns" (ignored by the translation machinery). Molecular genomics is a fascinating subject but it doesn't heavily impinge on the "gene's eye view" of evolution, which is the central theme of the book. To put the point another way, *The Selfish Gene* is quite likely a valid account of life on other planets even if the genes on those other planets have no connection with DNA. Nevertheless, there are ways in which the details of modern molecular genetics, the detailed study of DNA, can be gathered into the gene's eye fold and it turns out that they vindicate my view of life rather than casting doubt on it. I'll come on to this after what may seem like a radical change of subject, beginning with a specific question, which obviously stands for any number of similar questions.

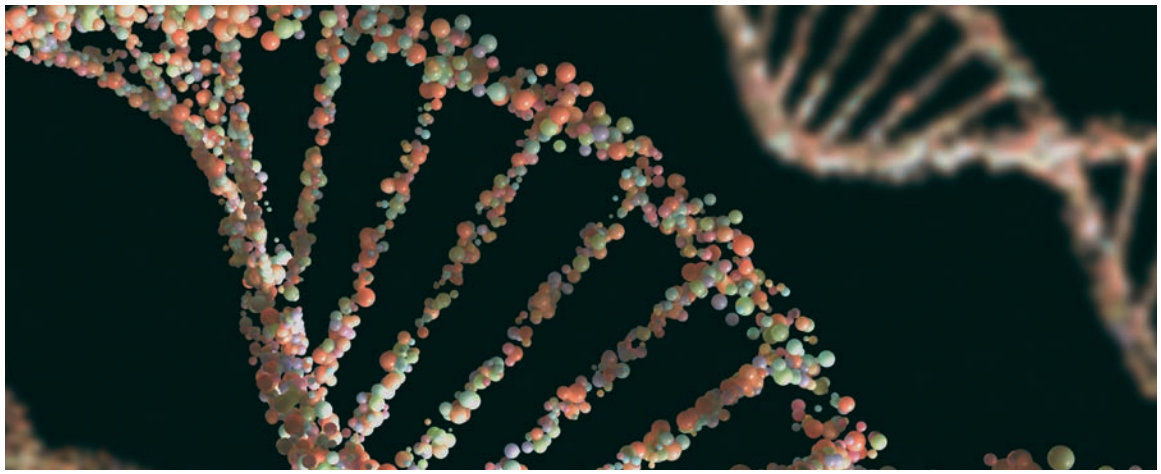
How closely related are you to Queen Elizabeth II? As it happens, I know I'm her fifteenth cousin twice removed. Our common ancestor is Richard Plantagenet, 3rd Duke of York (1412–1460). One of Richard's sons was King Edward IV, from whom Queen Elizabeth is descended. Another son was George, Duke of Clarence, from whom I am descended (allegedly drowned in a butt of Malmsey

wine). You may not know it but you are very probably closer to the Queen than fifteenth cousin and so am I and so is the postman. There are so many different ways of being somebody's distant cousin, and we are all related to each other in many of those ways. I know that I am my wife's twelfth cousin twice removed (common ancestor George Hastings, 1st Earl of Huntingdon, 1488–1544). But it is highly probable that I am a closer cousin to her in various unknown ways (various pathways through our respective ancestries), and it is absolutely certain I am also her more distant cousin in many more ways. We all are. You and the Queen might simultaneously be ninth cousins six times removed, and twentieth cousins four times removed, and thirtieth cousins eight times removed. All of us, regardless of where in the world we live, are not only cousins of each other. We are cousins in hundreds of different ways. This is just another way of saying we are all members of the background population among whom *r*, the coefficient of relatedness, approaches zero. I could calculate *r* between me and the Queen using the one pathway for which records exist, but it would, as the definition requires, be so close to zero as to make no difference.

The reason for all that bewildering multiplicity of cousinship is sex. We have two parents, four grandparents, eight great-grandparents, and so on, up to astronomical numbers. If you go on multiplying by two back to the time of William the Conqueror, the number of your ancestors (and mine, and the Queen's and the postman's) would be at least a billion, which is more than the world population at the time. That calculation alone proves that, wherever you come from, we share many of our ancestors (ultimately all if you go sufficiently far back) and are cousins of each other many times over.

All that complexity disappears if you look at cousinship from the gene's point of view (the point of view advocated, in different ways, throughout this book) as opposed to the individual organism's point of view (as has been conventional among biologists). Stop asking: What kind of cousin am I to my wife (the postman, the Queen)? Instead, ask the question from the point of view of a single gene, say my gene for blue eyes: What relation is my blue eye gene to the postman's blue eye gene? Polymorphisms such as the ABO blood groups go way back in history, and are shared by other apes and even monkeys. The A gene in a human sees the equivalent gene in a chimp as a closer cousin than the B gene in a human. As for the SRY gene on the Y chromosome, which determines maleness, my SRY gene "looks upon" the SRY gene of a kangaroo as its kissing cousin.

Or we can look at relatedness from a mitochondrion's point of view. Mitochondria are tiny bodies teeming in all our cells, vital to our survival. They reproduce asexually and retain the remnants of their own genomes (they are remotely descended from free-living bacteria). By the Williams definition, a mitochondrial genome can be thought of as a single "gene." We get our mitochondria from our mothers only. So if we were now to ask how close is the cousinship of your mitochondria to the Queen's mitochondria there is a single answer. We may not know what that answer is, but we do know that her mitochondria and yours are cousins in only one way, not hundreds of ways as is the case from the point of view of the body as a whole. Trace your ancestry back through the generations, but always only through the maternal line and you follow a single narrow (mitochondrial) thread, as opposed to the ever branching thread of "whole organism pedigrees." Do the same for the Queen, following her narrow maternal thread back through the generations. Sooner or later the two threads will meet and now, by simply counting generations along the two threads, you can easily calculate your mitochondrial cousinship to the Queen.



What you can do for mitochondria, you can in principle do for any particular gene, and this illustrates the difference between a gene's point of view and an organism's point of view. From a whole organism point of view you have two parents, four

grandparents, eight great-grandparents, etc. But, like a mitochondrion, each gene has only one parent, one grandparent, one great-grandparent, etc. I have one gene for blue eyes and the Queen has two. In principle we could trace the generations back and discover the cousinship between my blue eye gene and each of the Queen's two. The common ancestor of our two genes is called the "coalescence point." Coalescence analysis has become a flourishing branch of genetics and very fascinating it is. Can you see how congenial it is to the "gene's eye view" that this whole book espouses? We are not talking about altruism any more. The gene's eye view is flexing its muscles in other domains, in this case looking back at ancestry.

You can even investigate the coalescence point between two alleles in one individual body. Prince Charles has blue eyes and we can assume that he has a pair of blue eye alleles opposite each other on Chromosome 15. How closely related to each other are Prince Charles' two blue eye genes, one from his father, one from his mother? In this case we know one possible answer, only because royal pedigrees are documented in ways that most of our pedigrees are not. Queen Victoria had blue eyes and Prince Charles is descended from Victoria in two ways: via King Edward VII on his mother's side; and via Princess Alice of Hesse on his father's side. There's a 50 percent probability that one of Victoria's blue eye genes peeled off two copies of itself, one of which went to her son, Edward VII, and the other to her daughter Princess Alice. Further copies of these two sibling genes could easily have passed down the generations to Queen Elizabeth II on one side and Prince Philip on the other, whence they were reunited in Prince Charles. This would mean the "coalescence" point of Charles's two genes was Victoria. We do not—cannot—know whether this actually is true for Charles' blue eye genes. But statistically it has to be true that many of his pairs of genes coalesce back in Victoria. And the same kind of reasoning applies to pairs of your genes, and pairs of my genes. Even though we may not have Prince Charles' well-documented pedigree to consult, any pair of your genes could, in principle, look back at their common ancestor, the coalescence point at which they were "peeled off" from a single ancestral gene.

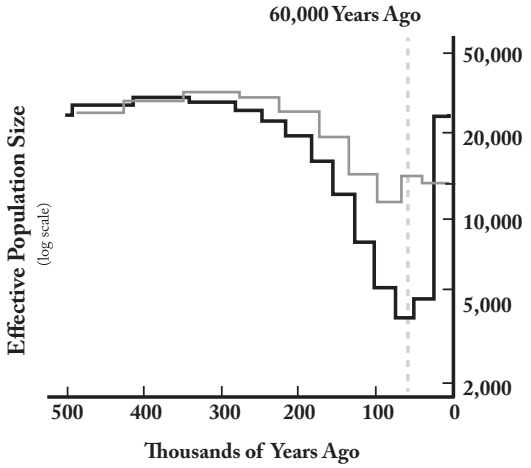
Now, here's something interesting. Although I can't establish the exact coalescence point of any particular allelic pair of my genes, geneticists can in principle take all the pairs of genes from any one individual and, by considering all possible pathways back through the past (actually not all possible pathways because there are too many, but a statistical sample of them), derive a pattern of coalescences across the whole genome. Heng Li and Richard Durbin of the Sanger Institute in Cambridge realized a remarkable thing: the pattern of coalescences among pairs of genes in the genome of a single individual gives us enough information to reconstruct demographic details about datable moments in the prehistory of an entire species.

In our discussion of coalescence between pairs of genes, one from the father and one from the mother, the word *gene* means something a bit more fluid than the normal usage of molecular biologists. Indeed, you could say that the coalescence geneticists have reverted to something a bit like my "slightly selfish big bit of chromosome and even more selfish little bit of chromosome." Coalescence analysis is studying chunks of DNA which might be larger or even smaller than a molecular biologist's understanding of a single gene but which can still be seen as cousins of each other, having been "peeled off" from a shared ancestor some definite number of generations ago.

When a gene (in that sense) "peels off" two copies of itself and gives one to each of two offspring, the descendants of those two copies may, over time, accumulate differences due to mutation. These may be "under the radar" in the sense that they don't show up as phenotypic differences. The mutated differences between them are proportional to the time that has elapsed since the split, a fact that biologists make good use of, over much greater time spans, in the so-called "molecular clock." Moreover, the pairs of genes whose cousinship we are calculating needn't have the same phenotypic effects as each other. I have one blue eye gene from my father paired with one brown eye gene from my mother. Although these genes are different, even they must have a coalescence somewhere in the past: the moment when a particular gene in a shared ancestor of my two parents peeled off one copy for one child and another copy to its sibling. That coalescence (unlike the two copies of Victoria's blue eye gene) was a long time ago, and the pair of genes has had a long time to accumulate differences, not least the difference in the eye colours that they mediate.

Now, I said that the coalescence pattern within one individual's genome can be used to reconstruct details of demographic prehistory. Any individual's genome can do this. As it happens, I am one of the people in the world who has had his complete genome sequenced. This was for a television programme called *Sex, Death and the Meaning of Life* which I presented on Channel Four in 2012. Yan Wong, my co-author of *The Ancestor's Tale*, from whom I learned everything I know about coalescence theory and much else besides, seized upon this and did the necessary Li/ Durbin style calculations using my genome, and my genome alone, to make inferences about human history. He found a large number of coalescences around 60,000 years ago. This suggests that the breeding population in which my ancestors were embedded was small 60,000 years ago. There were few people around, so the chance of a pair of modern genes coalescing in the

same ancestor back at that time was high. There were fewer coalescences 300,000 years ago, suggesting that the effective population size was larger. These figures can be plotted as a graph of effective population size against time. Here's the pattern he found, and it is the same pattern as the originators of the technique would expect to find from any European genome.




From R. Dawkins and Y. Wong (2006) *The Ancestor's Tale*, 2nd edition
Image courtesy of Y. Wong.

The black line shows the estimates of effective population size at various times in history based upon my genome (coalescences between genes from my father and my mother). It shows that the effective population size among my ancestral population plummeted around 60,000 years ago. The grey line shows the equivalent pattern derived from the genome of a Nigerian man. It also shows a drop in population around the same time, but a less dramatic one. Perhaps whatever calamity caused the drop was less severe in Africa than in Eurasia.

Incidentally Yan was my undergraduate pupil in New College, Oxford, before I started learning more from him than he learns from me. He then became a graduate student of Alan Grafen, whom I had also tutored as an undergraduate, who subsequently became my graduate student and whom I have described as being now my intellectual mentor. So Yan is both my student and my grandstudent—a neat memetic analogue to the point I was making earlier about how we are related in multiple ways—although the direction of cultural inheritance is more complicated than this simple formulation implies.

To summarize, the gene's eye view of life, the central theme of this book, illuminates not just the evolution of altruism and selfishness, as expounded in previous editions. It also illuminates the deep past, in ways of which I had no inkling when I first wrote *The Selfish Gene* and which are expounded more fully in relevant passages (largely written by Yan, my co-author) of the second edition (2016) of *The Ancestor's Tale*. So powerful is the gene's eye view, the genome of a single individual is sufficient to make quantitatively detailed inferences about historical demography. What else might it be capable of? As foreshadowed by the Nigerian comparison, future analyses of individuals from different parts of the world could give a geographic dimension to these demographic signals from the past.

Might the gene's eye view penetrate the remote past in yet other ways? Several of my books have developed an idea which I called "The Genetic Book of the Dead." The gene pool of a species is a mutually supportive cartel of genes that have survived in particular environments of the past, both distant and recent. This makes it a kind of negative imprint of those environments. A sufficiently knowledgeable geneticist should be able to read out, from the genome of an animal, the environments in which its ancestors survived. In principle, the DNA in a mole *Talpa europaea* should be eloquent of an underground world, a world of damp, subterranean darkness, smelling of worms, leaf decay, and beetle larvae. The DNA of a dromedary, *Camelus dromedarius*, if we but knew how to read it, would spell out a coded description of ancient ancestral deserts, dust storms, dunes, and thirst. The DNA of *Tursiops truncatus*, the common bottlenose dolphin, spells, in a language that we may one day decipher, "open sea, pursue fish fast, avoid killer whales." But the same dolphin DNA also contains paragraphs about earlier worlds in which the genes survived: on land when the ancestors escaped the attentions of tyrannosaurs and allosaurs long enough to breed. Then, before that, parts of the DNA surely spell out descriptions of even older feats of survival, back in the sea, when the ancestors were fish, pursued by sharks and even eurypterids (giant sea scorpions). Active research on "The Genetic Book of the Dead" lies in the future. Will it colour the epilogue of the fiftieth anniversary edition of *The Selfish Gene*? ■

Richard Dawkins is one of the most influential science writers and communicators of our generation. After a long career as a professor of zoology at Oxford University, he served as the first Charles Simonyi Chair of the Public Understanding of Science at Oxford from 1995 until 2008, and is an Emeritus Fellow of New College. ***The Selfish Gene*** catapulted him to fame and remains his most famous and widely read book. He is a Committee for Skeptical Inquiry fellow.

# God's Own Medicine

History's unlearned lesson about opium-based pain relievers and addiction.

PAUL A. OFFIT

In 2008, overdoses from opium-based painkillers surpassed motor vehicle accidents as the most common cause of accidental death in America. The reason: we've failed to learn from history.

About 6,000 years ago, around the time of Abraham, the Sumerians settled between the Tigris and Euphrates Rivers. They invented cuneiform writing. They invented farming. And they discovered a plant called "hul gil," or "the plant of joy." Carl Linneaus, an eighteenth-century botanist, called it *Papaver somniferum*. William Osler, the founder of Johns Hopkins Hospital, called it "God's own medicine." Today we call it the opium poppy.

One of the first to embrace opium was Hippocrates, who used it to treat insomnia. But it was a relatively unknown contemporary of Hippocrates named Diagoras of Melos who was the first to notice that many of his fellow Greeks had become addicted to the drug—hopelessly addicted. He warned against its use as opium users became opium addicts.

Two thousand years passed.

In 1803, Frederich Sertürner, a twenty-year-old German chemist, purified opium's most abundant and most active ingredient. He called it "morphium" after the Greek God of Dreams: Morpheus. Sertürner found that morphium was six times more powerful than opium. He reasoned that with lesser quantities of the drug required to relieve pain, fewer people would become addicted. It didn't work out that way. When he finished his studies, he was addicted to morphine. Sertürner warned, "I consider it my duty to attract attention to the terrible effects of this new substance I called *morphium* in order that calamity may be averted." Again, no one listened. Within thirty years, the German pharmaceutical company Merck began mass-producing the drug, calling it morphine.

Opium addicts became morphine addicts.

In 1874, C.R. Alder Wright took the next step. He boiled morphine with the reactive form of acetic acid, producing a grey-white powder with the chemical name diacetylmorphine. Wright believed that he, too, had created a non-addictive form of the drug. So he fed it to his dog, who became violently ill and frighteningly hyperactive. Wright threw the powder away—but not before publishing his findings in the *Journal of the Chemical Society of London*. Twenty years passed before anyone paid attention to Wright's new compound.

The first to pick up on Wright's experiment was a young chemistry professor named Heinrich Dreser who worked for a pharmaceutical company in the Rhineland named Bayer Laboratories. Dreser found, as had Wright before him, that diacetylmorphine was five

times more potent than morphine and crossed the blood-brain barrier much more efficiently; as a consequence, lesser quantities of the drug were necessary to relieve pain. Dreser believed that he, too, had created a nonaddictive pain reliever. So he fed diacetylmorphine to rats, rabbits, a few workmen in his company, and a handful of local patients. Everyone seemed to love the drug, and no one had become addicted after four weeks of observation. Dreser was certain that he had stumbled upon the Holy Grail of pain relief.

In September 1898, Heinrich Dreser presented his findings to the 70th Congress of German Naturalists and Physicians. Even though he had no evidence to support his claims, Dreser said that diacetylmorphine could treat colds, sore throats, headaches, and severe respiratory infections. Dreser also believed that he had created the perfect drug to treat morphine addiction. Attendees at the meeting gave him a standing ovation.

At first, Bayer couldn't decide what to name its new blockbuster drug. Some executives wanted to call it *wunderlich*, meaning miracle. Others wanted to call it *heroisch*, meaning heroic. The second group won out. In 1898, Bayer executives launched their new drug at the same time that they launched Bayer Aspirin. They called it Bayer Heroin. Because clinicians feared that aspirin might cause gastritis, the drug was available by prescription only. Heroin, which was believed to be safe, was available over the counter. In 1900, Eli Lilly, working in collaboration with Bayer, began distributing heroin in the United States. Clinicians embraced the drug. In 1906, the American Medical Association recommended heroin for the treatment of "bronchitis, pneumonia, consumption [tuberculosis], asthma, whooping cough, laryngitis, and certain forms of hay fever."

Morphine addicts became heroin addicts.

It was back to the drawing board. Certainly there must be some way to separate pain relief from addiction. Again, scientists turned to opium. This time, however, they turned away from morphine. Although morphine is the most powerful component in opium, it isn't the only component. Opium also contains codeine (methlymorphine), a mild analgesic and cough suppressant; alpha-narcotine and papaverine, two muscle relaxants; and thebaine, which was named for Thebes, a town in Egypt where the opium poppy was grown. Thebaine formed the basis of the next attempt to separate pain relief from addiction.

The first synthetic version of thebaine was produced in 1916 by two German chemists working at the University of Frankfurt. They called it oxycodone, an opioid. (By definition, an opiate is a drug obtained directly from opium, such as morphine; an opioid is an opiate that has been synthetically modified, such as heroin or oxycodone.)

Oxycodone made its American debut in the early 1950s in combination with aspirin (brand name Percodan), ibuprofen (Combunox), or acetominophen (Percocet). But the most addictive, most abused, and most deadly form of the drug was pure oxycodone offered in a time-released preparation called OxyContin, which was manufactured by Purdue Pharmaceuticals. By chewing the drug, users could bypass the time-release mechanism and ingest as much as 160 milligrams of oxycodone—a lethal dose of the drug. (Ironically, on a weight-by-weight basis, oxycodone is actually *more* powerful than morphine.)

Heroin addicts became opioid addicts.

In 2002, a survey taken at a high school in rural Michigan found that 98 percent of students had heard of OxyContin and 9.5 percent had tried it.

In 2003, Rush Limbaugh, who had mocked drug abusers on his radio show for being morally bankrupt, admitted that he was addicted to OxyContin.

In 2004, three million people were using OxyContin, the most prevalent prescription painkiller in the United States.

In 2007, 14,000 people in the United States died from prescription painkillers, a problem that cost the health care and criminal justice systems more than $55 billion.

In 2008, 15,000 people died from prescription painkillers, the leading cause of accidental deaths in thirty states.

In 2009, health insurers spent $72 billion in direct healthcare costs related to the treatment of addiction to painkillers.

In 2010, more people died from prescription painkillers than from heroin and cocaine combined.

In 2012, 12 million Americans reported the recreational use of prescription painkillers.

In 2014, retail pharmacies dispensed 245 million prescriptions for painkillers. About 2.5 million adults were addicted to the drug.

In 2015, 19,000 people died from prescription painkillers. More young people died from opioid overdose than from motor vehicle accidents.

Today, the United States, which contains 5 percent of the world's population, uses 80 percent of the world's painkillers.

On January 16, 2016, Gina Kolata and Sarah Cohen, in an article for the *New York Times*, stated, "The rising death rates for young white adults make them the first generation since the Vietnam War years of the mid-1960s to experience higher death rates in early adulthood than the generation that preceded it."

On March 15, 2016, the Centers for Disease Control and Prevention (CDC) issued guidelines to physicians in an attempt to control the raging epidemic of opioid abuse. The CDC recommended that doctors should prescribe opioids, 1) only after nonprescription painkillers and physical therapies have failed; 2) in quantities not to exceed a three-day supply for short-term pain; and 3) only when improvement was significant.

In the end, the medical profession's stubborn belief that it can separate pain relief from addiction has created a problem that will take decades to undo. ■

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# Why Skepticism?

## Sasquatch, Broken Windows, and Public Policy

Why do we have skeptic organizations? Let's look at the evidence.

RONALD A. LINDSAY

As a philosopher, I ask a lot of "why" questions, such as the notorious one often associated with philosophers: Why are we here? No, seriously. Why *are* we here? Why are we *here*? Why do self-described skeptics get together and exchange ideas, listen to speakers, plan skeptic-related activities, and so forth? In other words: Why skepticism?

That question may be a little broad to start, so for now, let me make it more concrete: Why skeptic organizations? It's one thing for people with similar interests to get together on occasion—that's inevitable—but why do we have formal skeptic organizations? What do they accomplish? There are a number of skeptic organizations throughout the world. In the United States, there are several regional and local organizations and a couple of national organizations such as the Center for Inquiry (CFI) and the Committee for Skeptical Inquiry (CSI). What purpose do they serve? Well, in the case of the CFI/CSI, one thing they do is publish Skeptical Inquirer magazine. It's a very good, informative magazine, but of course a cynic might ask: Isn't the magazine just another example of skeptics talking to other skeptics? Is Skeptical Inquirer anything more than a forum for conversation among skeptics and a useful way to raise money for the organization so the organization can pay people to publish the magazine, which raises money for the organization to pay people to publish the magazine . . . and so on?

That's the cynic's view, of course—and I'm no cynic. Skeptical Inquirer does not exist just to raise money to perpetuate itself; it serves an important educational function. But before I discuss some of the important purposes served by skeptic organizations and the skeptic movement, let me pause to explain why I am asking these questions. Originally when I planned this piece, I was going to focus almost exclusively on the public policy initiatives of CSI and CFI—especially in the area of alternative medicine. I'm still going to talk about those, because I think they are important and I think they illustrate one critical part of the mission of skeptic organizations. But I changed my focus somewhat because of something that happened a few months ago. At another skeptic conference, namely the NECSS conference (the Northeast Conference on Science and Skepticism), John Horgan, a science journalist, delivered a blistering attack on the skeptic movement (Horgan 2016). In particular, Horgan accused skeptics of spending their time attacking so-called soft targets such as homeopathy and Bigfoot, while ignoring harder targets, such as the use of drugs to treat mental illness—which he thinks are largely ineffective and possibly harmful—and war, which he argues we should not regard as inevitable, and is certainly not deep rooted in human nature.

What about this charge? Do skeptics spend too much time investigating and evaluating claims about homeopathy, Bigfoot, ghosts, UFOs, and so forth? And, if so, are such issues really soft targets? Is the effort spent on examining these topics essentially a waste of time?

To answer those questions, I think we first have to step back a bit and look at the evidence. Seems like a reasonable way for skeptics to proceed. Let's have a look at what unifies people who describe themselves as science-based skeptics, what they see as important activities, and what they consider the appropriate way to carry out these activities.

The mission statement of CSI provides a good place for us to start, doesn't it? Certainly, CSI's mission statement indicates how some skeptics see themselves. CSI states that it "promotes scientific inquiry, critical investigation, and the use of reason in examining contro-

versial and extraordinary claims."

Put another way, skeptics are interested in finding out the truth and are very much: 1) disinclined to accept the claim that X is true; 2) unless that claim has been properly evaluated; and 3) especially if the claim deals with something extraordinary or controversial.

The first two parts of that description are fairly self-explanatory. With respect to method, skeptics use scientific investigation where possible, testing claims under controlled conditions. Sometimes, of course, it is not possible to do that, so then we look at the alleged evidence for the claim and use reason, critical thinking, and our storehouse of accumulated scientifically validated knowledge to assess the claim.

But what about the third part of that description—the focus on *controversial* and *extraordinary* claims?

What's that mean exactly? The mission statement itself doesn't set forth any criteria for what constitutes an extraordinary or controversial claim.

So let me try to put some meat on the CSI mission statement by making a little clearer what constitutes a controversial or extraordinary claim and explaining why such claims should be the focus of work by skeptics. I'll begin by stating what CSI does *not* do, as this contrast will help clarify the scope of and rationale for CSI's work.

Let's start with an obvious point. Although CSI sponsors limited investigations on some discrete topics, neither CSI nor any skeptic organization does much work in the nature of basic scientific research. Even if it wanted to, CSI could not do much in the way of basic scientific research. CSI doesn't have the resources for that. Universities do basic research; some government agencies do basic research; to some extent commercial enterprises, such as drug manufacturers, do basic research; CSI does not do that. Skeptic organizations don't try to duplicate the work of scientists.

Of course, we support scientific research and communicate the results of the latest scientific research to the public, and these are important activities. There's a lamentable lack of understanding of science among the general public, and one task of skeptics, and skeptic organizations in particular, is to try to educate the public and, in doing so, to instill some recognition of the importance of scientific reasoning and critical thinking. In this regard, Skeptical Inquirer is very fortunate to have Ken Frazier, a justly renowned science journalist, as its editor. But other publications and organizations educate the public about science as well. *Scientific American*, for example, or NPR's *Science Friday* program, and so forth. And these publications and programs are not usually considered to be skeptic publications or programs.

**Support for science and education about science is one aspect of what we skeptics do, but that doesn't really make our work distinctive. What does make our work distinctive is attention to controversial and extraordinary claims.**

In other words, support for science and education about science is one aspect of what we skeptics do, but that doesn't really make our work distinctive. What does make our work distinctive is attention to controversial and extraordinary claims—those aspects of science that may not receive that much attention from other organizations—from the universities, from the government, from commercial enterprises.

So what are these controversial claims? Perhaps the best way to describe them is just by listing some examples. Here's a partial list of some controversial claims where skeptics have played both a constructive and a distinctive role: homeopathy, acupuncture, and a dozen other forms of alternative medicine; evolution; genetically modified organisms (GMOs); vaccination; climate change.

When I say these issues are controversial, that does not necessarily mean they are controversial among scientists. For most scientists, the ineffectiveness of homeopathy and acupuncture, the fact of evolution, the safety of GMOs, and the reality of climate change are not especially controversial. But they remain controversial *among the general public*. This is a crucial point because this highlights why what skeptics do is both important and unique.

The distinction between what most scientists think and what the general public thinks is one reason Horgan is mistaken when he says, for example, that homeopathy is a "soft target." From a scientific viewpoint, it's easy to show that homeopathic products are not effective, apart from a placebo effect. Moreover, the underlying theory that is supposed to support the usefulness of homeopathic products is nonsensical and is undercut by a basic knowledge of chemistry. In that sense, homeopathy *is* a soft target.

But that doesn't prevent homeopathic products from having a very significant market in the United States and worldwide, especially in Europe. In the United States alone, the homeopathic marketplace brings in roughly $3 billion to $4 billion a year in sales, and about five million adults use homeopathic products more than once each year. Why do people rely on something that scientifically cannot have any effect on their

conditions? Several reasons: First, many consumers think it does work, and in some cases, because of a placebo effect, it may provide some perceived relief; second, they do not understand or are not aware of the underlying chemical principles; third—and I believe this is both a critical and an often overlooked reason—homeopathic drugs are marketed just like any other remedy. The consumer sees them on the drugstore shelf alongside conventional products that have been tested and actually have active ingredients, and the consumer not unreasonably thinks a drugstore would not be allowed to sell these products unless they worked, right? Furthermore, for some people, homeopathic products actually have a marketing advantage over conventional drugs because in their ads and on their packaging they can boast of being "natural, safe, and gentle" with "no side effects" because, of course, they have no effects at all, neither direct effects nor side effects.

In addition, because companies can make a significant amount of money selling homeopathic junk, the homeopathic industry is fairly large and influential. No, Boiron and Hyland's are not Pfizer or Merck, but they are not the mom-and-pop pharmacy down at the corner either. These companies make significant profits, and they vigorously resist any tighter regulation of the marketing of homeopathic products. The science behind homeopathy may be a soft target, but the industry certainly is not.

Speaking of regulation, this brings me to another reason why homeopathy is not a soft target, and this is a reason that also underscores the importance of skeptic organizations. The homeopathic industry has enjoyed the passive support of the government, in particular the Food and Drug Administration (FDA). What do I mean by that? Well, homeopathic drugs are within the purview of the FDA. In fact, on many ads for homeopathic products, or on their packaging, you will see a proud reference to the fact that the drug is "regulated" by the FDA. The ordinary consumer thinks, of course, that this implies the FDA has required this drug to be tested for safety and efficacy. Wrong. Wrong. The FDA does *not* require homeopathic drug manufacturers to provide evidence of their products' safety and efficacy. Essentially, in most cases, all the FDA does is require that homeopathic drugs be prepared consistent with the homeopathic pharmacopeia and that the labeling for the drug accurately reflects that fact.

The reasons for this hands-off approach are somewhat complicated but essentially it's a blend of some of the messy history behind the passage of the original Food, Drug, and Cosmetic Act (one of the key sponsors was a homeopathic physician) and the FDA's own decisions about how best to use its limited resources. The scientists at the FDA are under no illusions about the fact that homeopathic drugs cannot be effective. But they believe that these drugs, for the most part, pose no significant danger provided they are used for self-limiting conditions and do not contain nondiluted active ingredients, such as zinc. The FDA has issued warning letters when these conditions have not been met. Just recently, for example, the FDA issued a warning letter advising consumers to stop using homeopathic teething tablets because there were reports of adverse reactions, possibly due to the tablets containing trace amounts of belladonna. Similarly, a few years ago during the avian flu scare, the FDA issued a warning letter instructing homeopathic manufacturers to stop advertising their products as a cure for the flu.

But, for the most part, the FDA gives homeopathic manufacturers a pass—which means that there are millions of people spending money on worthless products. Moreover, in some cases they almost certainly are foregoing conventional medicine to rely on a drug that will do nothing to help them.

In addition, with some exceptions, most scientists are not interested in doing anything about the lack of proper regulatory oversight by the FDA. Why would they be? Why would you run a study trying to see, for example, whether certain homeopathic drugs are really effective? There have been some studies done, but the most comprehensive study was one sponsored by the Australian government. It concluded that there are no health conditions for which there is reliable evidence that homeopathy is effective. With respect to private researchers, there's little incentive either to study homeopathy or to campaign against marketing homeopathic drugs. You're not going to win a Nobel Prize conducting a study that shows that sugar tablets are not an effective treatment.

So this is where skeptics and skeptic organizations can step in: to advocate on issues of public significance where most of the scientific community either does not have much interest or, for other reasons, does not want to take on a prominent advocacy role.

I'm proud to say that during my tenure at CFI and CSI, we petitioned the FDA for tighter regulation of homeopathic products, and in 2015 both the FDA and the Federal Trade Commission (FTC), which has jurisdiction over product advertising, held hearings on the need for such regulation. We

**Skeptics and skeptic organizations can advocate on issues of public significance where most of the scientific community either does not have much interest or, for other reasons, does not want to take on a prominent advocacy role.**

submitted comments to both agencies (you can find them on our website, "CFI and Dawkins Foundation Urge" 2015), and Michael DeDora, CFI's director of government affairs, testified at the FDA hearing. Interestingly, other than a professor from Georgetown University, Michael was the only witness, as I recall, who argued for tighter regulation. Most of the witnesses at that hearing were representatives of the homeopathic industry.

We are no longer waiting to hear from these agencies. After I first delivered a version of these remarks at CSICon Las Vegas in October, the FTC on November 15 issued an enforcement policy statement that requires homeopathic products to use labeling indicating there is no scientific evidence that they work. Homeopathic products must now indicate in their advertising and labeling that there is no scientific evidence that the product works and the product's claims are based on theories from the 1700s that are not accepted by most modern medical experts. See News and Comment, this issue, and http://tinyurl.com/z8dmhgt.

I had predicted that we might not hear until after the 2016 election because there could be political fallout if the agencies impose tighter regulation. You can imagine how some politicians would spin it, right? "Obama's federal government is trying to take away your medicine." However, I'm cautiously optimistic, especially now that the FTC has made its ruling. Even if the FDA doesn't require homeopathic drugs to be tested for safety and efficacy, which would effectively mean the end of the homeopathic industry, I am hopeful that it too will require that homeopathic products stop making healthcare claims that cannot be substantiated.

As the marketing of homeopathic drugs indicates, some issues do have a significant impact on the public even though, for one reason or another, the general scientific community may not have a strong interest or may not want to engage in vigorous advocacy. This is especially true in the disputes over various forms of alternative medicine, whether it's acupuncture, Reiki, cupping, and so on. It's also true to some extent in disputes over GMOs and evolution. Genetically modified organisms have been studied to death. There is still some basic research to be done perhaps (and obviously each new product has to be separately tested), but the overwhelming evidence is that genetically modified crops are as safe to consume as any other crops. Nonetheless, there is continuing controversy in the United States over GMOs at the federal, state, and local level (and don't even talk to me about Europe). And, of course, even though the fact of evolution is well-established, there's still controversy over the teaching of evolution in many areas of the United States. Skeptics and skeptic organizations have a significant role to play in these controversies by helping to ensure, through their advocacy, that public policy, whether it's government regulation of food ingredients or school board policy on curricula, reflect science and not ideology.

**As the marketing of homeopathic drugs indicates, some issues do have a significant impact on the public even though, for one reason or another, the general scientific community may not have a strong interest or may not want to engage in vigorous advocacy.**

I think I've shown that skeptic organizations have a role to play on controversial issues and that, contrary to what John Horgan asserted in his speech, we skeptics don't just talk to ourselves while poking fun at the gullible.

Let me pivot now to talk about *extraordinary* claims, claims that may not have that much relevance to public policy but on which a number of skeptics focus their energy. These are claims about bizarre entities, such as Bigfoot, ghosts, and aliens, or extraordinary powers, such as remote viewing, mind reading, and so on. People are, of course, free to spend their time as they see fit, and neither CSI nor any skeptic organization has any authority over what skeptics investigate and evaluate. But why should skeptic organizations devote resources to support investigations of these extraordinary claims?

First, the extent to which skeptics actually devote time to these various issues has been exaggerated. Just look at the topics for speeches and panels at our CSICon conference. Relatively little time has been devoted to these extraordinary claims. You would reach the same conclusion if you looked at the contents of Skeptical Inquirer, especially contents over the last decade. That said, it's undeniable that this is a set of topics addressed by skeptics and to which CSI and Skeptical Inquirer devote some of their resources. Why? Although you can never refute with absolute certainty any claim about the existence of some entity or power—because then you would be talking about metaphysics, not science—most every skeptic recognizes that it is highly improbable that there are ghosts, a creature such as Bigfoot, chupacabras, or that people have the power to do remote viewing or mind reading.

It is true, of course, that to take just one example, if it were shown that there were ghosts, that would have a very, very significant impact on our understanding of the world. It would imply, among other things, that some people live on in some form after their death. A pretty significant finding. So one could justify *some* investigation and evaluation of these types of claims on the ground

that were they true, that would have an extraordinary impact on how we view the world and ourselves. But that's a very thin justification. Let me try another one.

Some of you may have heard of the broken windows theory of policing. This is the view that police should not ignore low-level offenses such as loitering or minor vandalism—hence the term "broken windows"—because to do so fosters an atmosphere of lawlessness leading to more serious crimes. Although there is some empirical evidence to support this theory, it's very controversial in part because of the claim that broken windows policing disproportionately affects minorities and the poor. Please note: I'm not here to defend broken windows policing; I just want to suggest that something analogous may provide justification for critically examining the types of extraordinary claims I've mentioned—claims about Bigfoot, ghosts, and so forth.

I don't have to tell this audience that belief in these paranormal or extraordinary entities and powers is widespread. Depending on the survey one consults, somewhere between 30 percent and 40 percent of the American population believes in ghosts; about 30 percent believes in astrology; and more than 30 percent believes in telepathy. Poor Bigfoot usually doesn't attract quite as much support, typically around 15 percent—but that's still more than most third-party candidates enjoy!

Still, if gullibility were restricted to believing in ghosts, Bigfoot, or astrology, you might just shrug your shoulders at these numbers and say, so what? Yes, these people are sadly mistaken, but does it really make a difference?

The thing is it *does* make a difference, not so much because of what they believe, but because of how they come to believe. There are studies showing that the type of intuitive, magical thinking associated with belief in the paranormal and extraordinary entities is also associated with belief in conspiracies and with a difficulty in processing and in understanding science-based reasoning (Lobato et al. 2014). Furthermore, and this is a critical point, there is also some research indicating that getting people to think more analytically can reduce the type of intuitive thinking that leads to belief in the paranormal and in conspiracies (Gervais 2015). In other words, if we want people to be more receptive to science on really important public policy matters, such as regulating alternative medicine, GMOs, and so forth, we can't ignore the windows that Bigfoot is breaking. We need to inculcate critical thinking with respect to *all* claims, including claims that in the abstract may not seem that important, so people acquire the habit of using critical thinking on the really important issues.

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To sum up, skeptics and skeptic organizations are doing valuable work when they investigate and evaluate both controversial and extraordinary claims. The issues we address are only "soft" targets in the sense that there may be little scientific support for some of these claims. But these claims actually can be very resilient because of ideological support or commercial interests or because the habits of thought of too many people lead them to indulge in intuitive, magical thinking, which makes them susceptible to accepting claims that don't have scientific support. Although believing in Casper or Sasquatch in isolation may seem harmless, if we leave these claims unrebutted, and if we don't teach people about the proper way to analyze some of these claims, we are going to have a lot more people believing that 9/11 was an inside job, that climate change is a hoax, that our government is controlled by aliens, and so forth—and those beliefs are far from harmless.

So keep active, keep up the good work, and support organizations such as CFI and CSI so we can continue to advocate for appropriate science-based public policies, and we can continue to educate the general public about the methods of science and evidence-based reasoning. ■

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# Why We Believe —Long After We Shouldn't

Our brains are wired for self-justification and dissonance-reduction. We can override that impulse by learning how to admit our mistakes and separate them from our self-esteem.

CAROL TAVRIS AND ELLIOT ARONSON

It's pretty clear nowadays that we are not the rational animals we'd like to believe we are; in fact, we are more accurately called the "rationalizing animal." Skeptics are often puzzled when we calmly provide evidence that a popular belief is wrong, that some group is holding onto a way of doing things that's long past its sell-by date, and recipients of this valuable information don't say, "Why, *thank you*! I had no idea!" Why would people prefer to justify mistaken beliefs, behavior, and practices rather than change them for better ones? Isn't it good to know you didn't cause your child's autism with vaccinations?

As skeptics we are faced constantly with what psychologists call "the motivated rejection of science." Take global warming, for example. It's easy to assume that climate-change deniers are less educated or informed than wise scientists, but it's not so simple. An article in *Psychological Science* by Stephan Lewandowsky and Klaus Oberauer found that attitudes about global warming are *unrelated* to levels of scientific literacy, numeracy, or education. They *are* associated with political partisanship; that is, among liberals, higher levels of scientific literacy and education are associated with *increased* acceptance of climate change, the importance of vaccination, and trust in science. But among conservatives, higher levels of scientific literacy and education are associated with *reduced* acceptance. That's motivated cognition; people are emotionally motivated to reject findings that threaten their core beliefs or worldview. At present, the researchers found, public rejection of scientific findings is more prevalent on the political right than the left, yet, they added, "the cognitive mechanisms driving rejection of science are found regardless of political orientation." Meaning: It depends *what* scientific finding it is. Whether your worldview comes from the left or right, you will be tempted to sacrifice skepticism even when your side is promoting some cockamamie belief without evidence.

Decades ago, the great social psychologist Gordon Allport, in his brilliant book *The Nature of Prejudice*, offered this exchange to illustrate the weasely way a person with a prejudice or other entrenched belief argues with you.

> *Mr. X:* The trouble with Jews is that they only take care of their own group.
>
> *Mr. Y:* But the record of the Community Chest campaign shows that they give more generously, in proportion to their numbers, to the general charities of the community, than do non-Jews.
>
> *Mr. X:* That shows they are always trying to buy favor and intrude into Christian affairs. They think of nothing but money; that is why there are so many Jewish bankers.
>
> *Mr. Y:* But a recent study shows that the percentage of Jews in the banking business is negligible, far smaller than the percentage of non-Jews.
>
> *Mr. X:* That's just it; they don't go in for respectable business; they are only in the movie business or run night clubs.

Notice that people like Mr. X—which is all of us on occasion—don't actually argue or respond to the point; they slide off your evidence and raise an irrelevant digression rather than face, let alone change, their fundamental belief. "I believe it" becomes enough.

The key motivational mechanism

that underlies the reluctance to change our minds, to admit mistakes, and to be unwilling to accept unwelcome scientific findings is cognitive dissonance—the discomfort we feel when two cognitions, or cognition and behavior, contradict each other. Leon Festinger, who developed this theory sixty years ago, showed that the key thing about dissonance is that, like extreme hunger, it is uncomfortable, and, like hunger, we are motivated to reduce it. For smokers, the dissonant cognitions are "Smoking is bad for me" versus "I'm a heavy smoker." To reduce that dissonance, smokers either have to quit or justify smoking. Before we make a decision (about a car, a candidate, or anything else), we are as open-minded as we are likely to be; but after we make a decision, we have to reduce dissonance. To do this, we will emphasize everything good about the car we bought or the candidate we are supporting or the belief we accepted and notice only the flaws in the alternatives.

Dissonance theory comprises three cognitive biases in particular:

(1) The bias that we, personally, don't have any biases—the belief that we perceive objects and events clearly, as they really are. Any opinion I hold must be reasonable; if it weren't, I wouldn't hold it. If my opponents—or kids or friends or partner—don't agree with me, it is because *they* are biased.

(2) The bias that we are better, kinder, smarter, more moral, and nicer than average. This bias is useful for plumping up our self-esteem, but it also blocks us from accepting information that we have been not-so-kind, not-so-smart, not-so-ethical, and not-so nice.

(3) The *confirmation bias*, the fact that we notice and remember information that confirms what we believe and ignore, forget, or minimize information that disconfirms it. We might even call it the consonance bias, because it keeps our beliefs in harmony by eliminating dissonant information before we are even aware of it.

Dissonance is painful enough when you realize that you bought a lemon of a car and paid too much for it. But it's most painful when an important element of the self-concept is threatened; your post-car-purchase dissonance will be greater if you see yourself as a car expert and superb negotiator. We have two ways to reduce dissonance: either accept the evidence and change the self-concept ("Yes, that was a foolish/incompetent/unethical thing to do; was I ever wrong to believe that") or deny the evidence and preserve the self-concept ("That study was fatally flawed"). Guess which is the popular choice?

**Understanding cognitive dissonance helps explain the astonishing obstinacy that some people reveal when they are shown to be wrong.**

Understanding cognitive dissonance helps explain the astonishing obstinacy that some people reveal when they are shown to be wrong. Consider the conspiracy theorists who vehemently deny the horrifying evidence that Adam Lanza killed twenty children at Sandy Hook Elementary School. They maintain it was all a conspiracy of the gun-control lobby, and they persist in that delusion even when faced by grieving parents holding photos of their beloved children. But dissonance theory explains why people can hold crazy ideas without necessarily being crazy. If we start from where the disbelievers are, holding core beliefs in the importance of owning guns, that guns are safe, and that gun-control people want to take their guns away, then information that guns were used for a rampage that left twenty little children (and six school staff) dead is powerfully dissonant. By denying the evidence that this tragedy occurred, they get to retain their gun beliefs *and* their self-esteem: why, they were smart and right all along to oppose gun control of any kind. Indeed, dissonance theory would predict that their opposition would become even stronger—look at the effort those bastards put into creating the fiction of Sandy Hook. They must *really* want to take our guns away.

The greatest danger of dissonance reduction occurs not when a belief or action is a one-time thing like buying a car, but when it sets a person on a course of action. The metaphor that we use in our book is that of a pyramid. Imagine that two students are at the top of a pyramid, a millimeter apart in their attitudes toward cheating: it is not a good thing to do, but there are worse crimes in the world. Now they are both taking an important exam, when they draw a blank on a crucial question. Failure looms, at which point each one gets an easy opportunity to cheat by reading another student's answers. After a long moment of indecision, one spontaneously yields and the other resists. Each gains something important, but at a cost: one gives up integrity for a good grade; the other gives up a good grade to preserve his integrity.

As soon as they make a decision—to cheat or not—they will justify the action they took in order to reduce dissonance, that is, to keep their behavior consonant with their attitudes. They can't change the behavior, so they shift their attitude. The one who cheated will justify that action by deciding that cheating is not such a big deal: "Hey, everyone cheats. It's no big deal. And I needed to do

this for my future career." But the one who resisted the temptation will justify that action by deciding that cheating is far more immoral than he originally thought: "In fact, cheating is disgraceful. People who cheat should be expelled." By the time they finish justifying their actions, they have slid to the bottom and now stand at opposite corners of its base, far apart from one another. The one who didn't cheat considers the other to be totally immoral, and the one who cheated thinks the other is hopelessly puritanical—and, come to think of it, why don't I just buy the services of a professional cheater to take the whole course for me? I really need the credits, and so what if I never learn what this class requires? I'll learn on the job. Hey, neurosurgery can't be that hard.

As we go through life we will find ourselves on the top of many such metaphorical pyramids, whenever we are called upon to make important decisions and moral choices: for example, whether to accept growing evidence that a decision we made is likely wrong; decide whether or not a sensational rape or murder case in the media is true; whether to blow the whistle at company corruption or decide not to rock the boat. As soon as we make a decision, we stop noticing or looking for disconfirming evidence, and we are on that path to the bottom, where certainty lies.

This process blurs the distinction that people like to draw between "us good guys" and "those bad guys," or, occasionally in the skeptic world, "us smart, reasonable guys and those ignorant, crazy guys." Often, when standing at the top of the pyramid we are faced not with a clear go-or-no-go decision but instead with ambiguous choices whose consequences are unknown or unknowable. We make an impulsive decision, and then we justify it to reduce the ambiguity of the choice. And soon we are trapped in a process of action, justification, and further action that increases our commitment to that first tentative decision. Taking the next step down the pyramid in that direction is almost inevitable, because otherwise we have to go back up and say, "I was wrong to take that first little step." How do you corrupt an innocent person? How does a company or a country get enmeshed in illegal or unethical decisions? They only have to take a small step off the pyramid, and self-justification will do the rest.

Dissonance reduction has benefits, including letting us sleep at night—and besides it's good to hold an informed opinion and not change it with every fad or every new study that comes along. But it is also essential to be able to let go of that opinion when the weight of the evidence dictates, even if we are far down that pyramid. Dissonance reduction may be built into our mental wiring, but how we think about our mistaken actions and beliefs is not.

Living with dissonance requires us to learn how to admit our mistakes and separate them from our self-esteem. Our brains may be wired for self-justification, but that is no justification for not overriding the impulse—and we can. That's what the skeptical movement is designed to help us do: show that people can remain committed to their country, political party, friends, and family, yet understand that it is not disloyal to disagree with actions or policies or candidates we find wrong or reprehensible. And when *we* are faced with evidence of our own mistaken beliefs, we can learn to say: "When I, a kind and smart person, make a mistake, I remain a kind and smart person; the mistake remains a mistake. Now, how do I remedy what I did and make sure I don't repeat it?"

Skeptics already have an immense challenge in debunking pseudoscience, con artists, and conspiracy theories; to this burden we'd add another: facing our own sources of dissonance—ambiguity, complexity, and compromise. For some on the left, "compromise" means selling out; for some on the right, "compromise" means consorting with the enemy. But no politician will do everything we want; no feminist or civil rights activist can achieve 100 percent ideological purity; no human being can be 100 percent free of bias. That may be the most dissonant message of all. ■

**Skeptics already have an immense challenge in debunking pseudoscience, con artists, and conspiracy theories; to this burden we'd add another: facing our own sources of dissonance—ambiguity, complexity, and compromise.**

Carol Tavris and Elliot Aronson are social psychologists. This article is based on their book *Mistakes Were Made (But Not By ME): Why We Justify Foolish Beliefs, Bad Decisions, and Hurtful Acts*, recently released in an updated revised edition (Mariner, 2015).

# The Virtuous Skeptic

## Shouldn't Skeptics Know What They Are Talking about When They Are Talking about It?

MASSIMO PIGLIUCCI

What is skepticism? And how should a good skeptic approach her commitment to the field? These are crucial questions that most of us take for granted but that—I think—are worth pause to ponder and reevaluate from time to time. Which is what I intend to do in this article, introducing readers to an approach called "virtue epistemology," which has much to say of relevance to the conscientious skeptic.

The ethos of the modern skeptical movement, the one that traces its origins to Paul Kurtz and others in the 1970s, is perhaps best encapsulated by the phrase "extraordinary claims require extraordinary evidence," popularized by Carl Sagan but first articulated by Marcello Truzzi as "an extraordinary claim requires an extraordinary proof." Both versions, in turn, owe much to two illustrious antecedents: Pierre-Simon Laplace, who in 1812 wrote: "The weight of evidence for an extraordinary claim must be proportioned to its strangeness," and David Hume, who said in 1748: "A wise man . . . proportions his belief to the evidence."

Skepticism has evolved over the past several decades, expanding the circle of its concerns and therefore the type of claims it considers "extraordinary" and thus in need of proportional evidence in order to be verified. Moreover, skepticism has developed nationally and internationally as a powerful grassroots movement for the advocacy of science and critical thinking more generally. Broadly speaking, we can distinguish between those areas of inquiry that fall under "classic" skepticism—which include astrology, UFOlogy, psychics, paranormal experiences, ghosts, Bigfoot, and the like—and those additional issues that have contributed to evolve contemporary skepticism: intelligent design creationism, vaccine denialism, climate change denialism, and so forth. Some skeptics have even ventured into criticism of areas of academic research and scholarship, such as the replicability issue in psychology and the social sciences, the debate about the value of string theory in physics, and the general usefulness of philosophy.

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There are important differences among the three sets of topics I have just identified insofar as our average skeptical practitioner is concerned. When it comes to the first group (astrology, UFOlogy, etc.), skeptics have developed expertise of their own, arguably superior to that of your average scientist. It is more likely that a Joe Nickell or a James Randi will identify the problem with an alleged claim of paranormal activity than a scientist who is unfamiliar with fringe literature, the methodology of tricksters, or the unconscious biases that lead perfectly honest people to convince themselves that they have had an

extraordinary experience.

The second group of topics (including especially the various forms of modern "denialism") is trickier, as it requires a significantly deeper understanding of the underlying science. Here the skeptic can, at most, play a mediation role between the technical literature and the general public, but not really contribute directly herself to the research, unless of course she happens to be a medical researcher or an atmospheric physicist, for example.

The final group of topics (issues in psychological research, fundamental physics, philosophy) is, I maintain, so far outside of the realm of expertise of the average skeptic (unless, again, she happens to be a research psychologist, a particle physicist, or a philosopher) that the proper attitude is simply not to open one's mouth and to let the experts sort it out. This may sound harsh and unpalatable, but we need to be honest with both ourselves and the public at large: none of us is an expert on everything, and knowing one's own limitations is the beginning of wisdom, as Socrates famously reminded us. It also does a lot to enhance our credibility.

Humility and competence, then, are virtues that ought to be cultivated by any skeptic who wishes to intelligently comment on any of the three groups of issues I've outlined here. That is why skepticism would benefit enormously by a dip into the field of virtue epistemology. Let me explain.

#### Virtue Epistemology 101

Epistemology, of course, is the branch of philosophy that studies knowledge and provides the criteria for evidential warrant—it tells us when it is, in fact, rational to believe or disbelieve a given notion. Virtue epistemology is a particular approach within the field of epistemology, which takes its inspiration from virtue ethics. The latter is a general way to think about ethics that goes back to Aristotle and other ancient Greek and Roman thinkers.

Briefly, virtue ethics shifts thjat e focus from questions such as "Is this action right/wrong?" to "Is the character of this agent virtuous or not?" The idea is that morality is a human attribute, which has the purpose of improving our lives as individuals embedded in a broader society. As such, it does not yield itself to universal analyses that take a god's eye–view of things, but rather starts with the individual as moral agent.

Similarly with science: contrary to widespread belief (even among skeptics and scientists), science cannot aspire to a completely neutral view from nowhere, because it is by its own nature a human activity and is therefore bound by the limits (epistemic and otherwise) that characterize human intelligence and agency.

The best way to think about this is that science irreducibly depends on specific human perspectives and provides us therefore only limited access to the world-in-itself. We can observe and explore the world with increasingly sophisticated tools, but we will always have a partial view of reality and a distorted understanding of it.

That's why both the scientist and the skeptic can benefit from a virtue epistemological way of thinking: since scientific knowledge is irreducibly human, our focus should be on the human agent and the kind of practices that make it possible for her to arrive at the best approximation to the truth that is accessible to our species.

In practice, this means that we should be cultivating epistemic virtues and strive to stay away from epistemic vices. Below is a partial list of both (another useful list can be found in a classic essay, "Proper Criticism," by Ray Hyman, 2001):

This, of course, is much easier said than done, something that Aristotle—a good connoisseur of human psychology—understood very well. Which is why he said that virtue begins with understanding what one ought or ought

| Epistemic Virtues | Epistemic Vices |
|---|---|
| Attentiveness | Closed-mindedness |
| Benevolence (principle of charity) | Dishonesty |
| Conscientiousness | Dogmatism |
| Creativity | Gullibility |
| Curiosity | Naiveté |
| Discernment | Obtuseness |
| Honesty | Self-deception |
| Humility | Superficiality |
| Objectivity | Wishful thinking |
| Parsimony | |
| Studiousness | |
| Understanding | |
| Warranty | |
| Wisdom | |

**Both Sagan's and Feyerabend's points were not that there is any substance to astrology—they both knew better than that—but that it matters *how* one approaches public criticism of pseudoscience**

not to do but becomes entrenched only with much practice and endless corrections, allowing us to internalize its precepts.

So far our discussion has been rather theoretical, but skeptics (and scientists) are pragmatic people. They work best with actual examples that they can chew on and use for future reference. So let me present you two cases of failure of virtue epistemology on the part of skeptics, so that we can appreciate what is going on and how to do things better.

#### Case 1: In Defense of Astrology?

Back in the 1970s, Paul Feyerabend was a very controversial philosopher of science. He most famously wrote *Against Method*, in which he argued that there simply isn't any such thing as *the* scientific method. Scientists are pragmatic knowledge seekers; they use whatever method works and discard it as soon as it stops working. This position (which is now more or less standard in the field) means that science is not reducible to a how-to algorithm, programmable in a computer. It also led Feyerabend to advocate "methodological anarchism," the idea that we should let anyone pursue the truth however they like, regardless of initial plausibility or of the academic credentials of the individual. The good stuff will be selected in the open marketplace of ideas; the bad stuff will go away. (Methodological anarchism traces its ancestry back to John Stuart Mill, though it is not a mainstream view in philosophy, and for good reasons, but that's another story.)

Paul Kurtz

Feyerabend—shockingly from a skeptic's perspective—at one point wrote in defense of astrology. Not because he believed astrology has any merit, but in reaction to a famous manifesto against it that was initiated by none other than Paul Kurtz and countersigned by 186 scientists.

The anti-astrology manifesto read, in part:

> We, the undersigned—astronomers, astrophysicists, and scientists in other fields—wish to caution the public against the unquestioning acceptance of the predictions and advice given privately and publicly by astrologers. . . . In ancient times people believed in the predictions and advice of astrologers because astrology was part and parcel of their magical world view. . . . Why do people believe in astrology? In these uncertain times many long for the comfort of having guidance in making decisions. (Bok et al. 1975)

Surprisingly, Carl Sagan himself declined to sign the manifesto, explaining:

> I struggled with [the manifesto's] wording, and in the end found myself unable to sign, not because I thought astrology has any validity whatever, but because I felt . . . that the tone of the statement was authoritarian. It criticized astrology for having origins shrouded in superstition. But this is true as well for religion, chemistry, medicine and astronomy, to mention only four. The issue is not what faltering and rudimentary knowledge astrology came from, but what is its present validity. . . . Then there was speculation on the psychological motivations of those who believe in astrology. These motivations . . . might explain why astrology is not generally given the skeptical scrutiny it deserves, but is quite peripheral to whether it works. . . . The statement stressed that we can think of no mechanism by which astrology could work. This is certainly a relevant point but by itself it's unconvincing. No mechanism was known for continental drift . . . when it was proposed by Alfred Wegener in the first quarter of the twentieth century to explain a range of puzzling data in geology and paleontology. (Sagan 1976)

Feyerabend was even harsher:

> The learned gentlemen have strong convictions, they use their authority to spread these convictions (why 186 signatures if one has arguments?), they know a few phrases which sound like arguments, but they certainly do not know what they are talking about. . . . [The manifesto] shows the extent to which scientists are prepared to assert their authority even in areas in which they have no knowledge whatsoever. . . . It is interesting to see how closely both parties [i.e., astrologers and their critics] approach each other in ignorance, conceit and the wish for easy power over minds. (Feyerabend 1978)

Both Sagan's and Feyerabend's points were not that there is any substance to astrology—they both knew better than that—but that it matters *how* one approaches public criticism of pseudoscience. One must do it virtuously, by taking one's opponents' arguments seriously, engaging with them and deploying logic and evidence against them. One must also not simply attempt to use the weight of authority to squash a displeasing notion, because that would be intellectually unvirtuous. Although Sagan and Feyerabend did not use the language of virtue epistemology, they called for the scientists to behave better than the pseudoscientists, and rightly so.

### Case 2: The Campeche UFOs

My second example concerns a famous sighting of alleged UFOs over the Mexican state of Campeche on March 5, 2004, a case investigated by Robert Sheaffer for the Skeptical Inquirer (see Sheaffer 2008). The basic facts are these: That night, a reconnaissance aircraft of the Mexican government was flying over the states of Campeche and Chiapas, looking for evidence of drug smuggling. The crew videotaped the appearance of up to eleven unidentified objects that were visible only in the infrared. However, despite initial claims to the contrary, a local radar installation could not verify the sighting.

As soon as the local press reported the incident, there was an unfortunate rush of half-baked skeptic "solutions," all equally unfounded: according to local astronomer Jose de la Herrin, the UFOs were really meteor fragments; but for Dr. Julio Herrera of Mexico's National Autonomous University they were electrical flares in the atmosphere; not so in the opinion of Rafael Navarro, also of the National Autonomous University, who thought it was clearly sparks of plasma energy; by contrast, the Urania Astronomical Society of Morelos declared the objects to be a group of weather balloons. The Campeche UFOs, alas, were none of those things. Actual investigation—instead of armchair skepticism—by Sheaffer revealed them to be stationary objects on the ground, over the distant horizon—specifically, flares erupting from a group of oil wells.

In this case, too, it seems, the *a priori* "knowledge" of some skeptics (the phenomenon couldn't possibly be what it was purported to be) led to rather unvirtuous, completely unfounded in facts, "explanations" that had the only effect of tarnishing the reputation of the alleged skeptics themselves.

### A Checklist for the Virtuous Skeptic

So what is the big deal here? The problem is that skepticism shares its core values with science, and such values include intellectual honesty, epistemic humility, and a number of other virtues. What is supposed to separate us from creationists, climate change deniers, and all the rest is *not* that we happen to be (mostly, often) right and they aren't. It is that we really seek the truth, whatever it may turn out to be. This means we do the hard work of carrying out research; we don't just sit on a collective arse and pontificate.

To make sure of this, I suggest two things: First, a push toward a peer review system within the skeptic community modeled on the one used by scientists. Peer review has its own shortcomings (ask the psychological and medical communities), but having one's work checked by someone else is a first step toward improving the quality of what we publish. Second, here is a handy checklist for the aspiring virtuous skeptic to keep in mind whenever we are debunking the (alleged) nonsense *du jour*:

- Did I carefully consider my opponents' arguments without dismissing them out of hand?
- Did I interpret what my opponent said in the most charitable way possible before mounting a response?
- Did I seriously entertain the possibility that I may be wrong? Or am I too blinded by my own preconceptions?
- Am I an expert on this matter? If not, did I consult experts, or did I just conjure my own unfounded opinion out of thin air?
- Did I check the reliability of my own sources or just Google whatever was convenient to throw at my opponent?
- After having done my research, do I actually know what I'm talking about, or am I simply repeating someone else's opinion?

Virtue ethics is supposed to focus us on improving ourselves as moral agents. So, most of all, let us strive to live by Aristotle's own words: "Humility requires us to honor truth above our friends." ■

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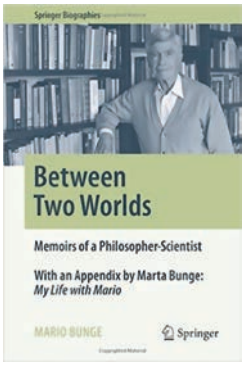
Massimo Pigliucci is the K.D. Irani Professor of Philosophy at the City College of New York, author of *Nonsense on Stilts: How to Tell Science from Bunk* (Chicago Press, 2010) and coeditor (with Maarten Boudry) of *Philosophy of Pseudoscience: Reconsidering the Demarcation Problem* (Chicago Press, 2013). He is a CSI fellow and blogs at platofootnote.org.

# The Scientist and the Philosopher

JAMES E. ALCOCK




*Between Two Worlds: Memoirs of a Philosopher-Scientist*. By Mario Bunge. Springer International Publishing, Switzerland, 2016. ISBN 978-3-319-39250-2. 496 pp., $129.

To review the 500-page memoirs of a ninety-seven-year-old, internationally renowned philosopher-scientist is at once an inspiring and challenging task. One cannot help but be inspired by the story of a young boy with an inquiring mind who escapes the intellectual shackles of the fascist society in which he is reared to become a highly respected intellectual on the world stage. And it is challenging to try to do justice to a life spanning nearly a century and comprising both fascinating twists and turns and an astonishingly productive academic career.

With regard to the latter, not only has Mario Bunge published hundreds of professional papers, but he has also written more than eighty books, including such heavy hitters as *Foundations of Physics* (1967), *Philosophy of Science* (1998, in two volumes), *Medical Philosophy* (2013), *Philosophy of Psychology* (1987), *Causality in Modern Science* (2008), and his magnum opus, an eight-volume *Treatise on Basic Philosophy* (series completed in 1989). He has been awarded sixteen honorary degrees as well as several honorary professorships, and his scholarly contributions have been recognized by fellowships in the Royal Society of Canada and the American Association for the Advancement of Science. He is a long-time fellow of the Committee for Skeptical Inquiry. And although nearly a centenarian, he continues to write and to lecture internationally.

I begin with full disclosure: I have long been an admirer of Mario Bunge and his work. More than that, he has had a significant effect on my own academic career, being directly responsible for my first book, a critical analysis of parapsychology. He not only encouraged me (indeed *ordered* me!) to write it, but he also facilitated its publication in 1981. However, since that time we have only rarely had the opportunity to interact, just enough to shake hands two or three times at conferences over the years.

Bunge's memoirs explore the factors that have shaped his character: his love of the pursuit of knowledge, his dedication to science, and his unflinching resistance to pseudoscience. However, memoirs tell us more than what people remember and have chosen to relate about their lives. It is not just what the person tells us about himself but also what the telling tells us about the person. More about that later.

### What Mario Bunge Tells Us about Himself

Because he writes so clearly and engagingly, the book carries the reader effortlessly along the river of his life. He describes the historic roots of the Bunge family tree, beginning long ago in Gotland, an island off the east coast of Sweden. His mother, a woman of humble origins, came to Argentina from Germany shortly before the First World War. There, she met his father, a physician, national congressman, and scion of a highly educated Argentine "patrician family" of German descent. His father's immediate family included among others a judge, an engineer, a physician, an economist, and an architect, and thus young Mario was cognizant of the value of education. And yet, his early academic career did not show great promise.

By his account, he was only a mediocre high school student. He was poorly motivated, he tells us, because he was not stimulated by his teachers, for whom he had little fondness, and, worse, intellectual curiosity was openly discouraged in his classrooms and questioning was not allowed! Nor did the larger Argentine society, trapped in the grips of Perón-style fascism, welcome intellectual inquiry. However, his supportive and loving parents stimulated his intense curiosity about nature. His father, a man of strong socialist leanings and intellectual courage, was his role model. He inspired young Mario to strive to become "an honest, concerned, useful citizen, ready to pay for my beliefs."

His early life was not without excitement. At one point in his childhood, burglars on horseback came to his house, chloroformed the family, and stole everything that they could cart away. He had few toys as a child but was encouraged by his parents to observe—but not disturb—the insects and animals that inhabited the orchards and

farms surrounding his home, which he described as a "small and uncomfortable shack." By age twelve, he writes, he was intrigued with nature and the origins of life and already took for granted that life had arisen from nonliving things.

At age eighteen, he made a New Year's resolution to focus his attention on serious intellectual matters, and higher education took on new importance. He was by that time already reading widely on a variety of subjects, and he had an early attraction to dialectical materialism (although he became increasingly disappointed with it over time). He was equally attracted to physics, psychology, and philosophy. The prospects for a career as a psychologist in Argentina were dismal at that time, and he soon lost interest in a career in philosophy after attending a few lectures by philosophers who were dismissive of science. This focused his attention on a career in science, although he kept his interests in philosophy alive by reading widely on the subject.

Through his father, he was exposed to many communist intellectuals while growing up, and when he asked his father why he had not joined the communist party, his father told him, "Because I want to retain my freedom of thought," a comment that obviously had a significant effect on young Mario. During the Second World War, the Depression worsened in Argentina, and the government was openly sympathetic to the Axis powers. Like his parents, he strongly opposed the fascist dictatorship in which he lived. His father was arrested because he presided over an association that raised funds for the Allies fighting the Axis powers. After his father's death from a massive stroke in 1943, his mother later joined a group opposing the military dictatorship. She was denounced to the political police and jailed. Decades later, after more open criticism about the dictatorship then headed by Perón's widow, she was grazed by a bullet shot through the window of her home as she sat reading.

Mario worked diligently against the repressiveness of his society. At one point, he set up a worker school. At another, he was briefly jailed because of his activities. His home was raided, and the police, ignorant of mathematical symbols, thought some of his mathematical papers could be coded subversive documents. "Had I not left the country at the beginning of 1963," he writes, "I would have been murdered, either by the dictatorship or by the *montonero* guerillas."

He completed a PhD in physical-mathematical science at Argentina's National University of La Plata in 1952, having begun his graduate training under the supervision of the distinguished physicist Guido Beck. However, after obtaining his doctorate, he was unable to find an academic appointment in Argentina. He was fiercely opposed to Perón, the president/dictator at the time, and so he lacked the all-important Perónist party card. As he describes it, without that card one could not even get a job as a dogcatcher. Fortunately, opportunity smiled upon him when David Bohm, one of the most important physicists of the twentieth century, invited him to a postdoctoral fellowship at the Theoretical Physics Institute at São Paulo University in Brazil.

**The question naturally arises: How did a physicist without a degree in philosophy become a world-renowned philosopher of science? That certainly did not come about in the usual way. He is essentially self-taught in philosophy.**

After Perón was forced to resign and go into exile in 1955, Bunge returned to Argentina and from 1956 to 1959 was a full professor of theoretical physics at the University of La Plata; he was simultaneously a full professor in the philosophy department at the University of Buenos Aires (1957–1962).

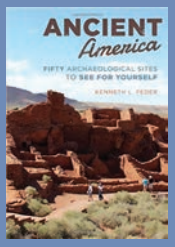
In 1966, he came to McGill University in Montreal as a Professor of Philosophy and was subsequently appointed to the prestigious position of Frothingham Professor of Logic and Metaphysics, a title he held until his formal retirement from the university at age ninety.

The question naturally arises: How did a physicist without a degree in philosophy become a world-renowned philosopher of science? That certainly did not come about in the usual way. He is essentially self-taught in philosophy. While pursuing physics, he continued to educate himself in philosophy. At age twenty-five he established *Minerva*, which he describes as "the only philosophy journal to circulate throughout the continent," and invited submissions from many philosophers. Unfortunately, the reception to *Minerva* was somewhere between lukewarm and hostile, he writes, and the journal folded a year later both because of a lack of submissions and a shortage of funds. As he looks back on that venture, he notes that "the Argentine philosophical community followed the national custom of rubbishing whoever did something new." This had been a costly initiative; he not only lost all the money he had invested, but his devotion to the journal had violated his full-time requirement as a student. His master's thesis supervisor and friend, Guido Beck, was so angry that he "expelled me from his flock."

He was kept to the margins of the philosophical community until 1956, when he received an invitation to participate in the Inter-American Congress of Philosophy. And ever since, he has met with success during his long academic career in both philosophy and physics. Witness the fact that he has been a visiting professor of philosophy at several universities and a visiting professor of physics at a number of others. However, he stresses that he has always been a

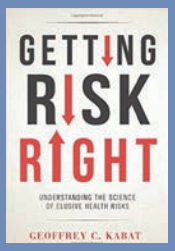
## [NEW AND NOTABLE

*Listing does not preclude future review.*




**ANCIENT AMERICA: Fifty Archaeological Sites to See for Yourself.** Kenneth L. Feder. The magnificent archaeological sites left by America's native peoples are wondrous enough without the myths and exaggerations that often contaminate popular discussions about them. There is no one better than archaeologist and CSI Fellow Kenneth Feder at debunking the misconceptions and stereotypes and then showing in reader-friendly prose what's real and true. The fifty sites in the welcome and lively new book *Ancient America* reveal an extraordinary legacy of intelligent and capable ancient peoples and cultures. With black & white and color photos. Rowman & Littlefield, 2017, 232 pp., $45.

**THE BIG PICTURE: On the Origin of Life, Meaning, and the Universe Itself.** Sean Carroll. In this lengthy book, the Caltech theoretical physicist and popular writer Sean Carroll has two goals: The first is to explain the story of our universe and why we think it's the true, big picture as we currently understand it ("a fantastic conception"). The second is a "bit of existential therapy." He argues that though we are part of a universe that runs according to impersonal underlying laws, we nevertheless *matter.* This, he acknowledges, isn't a scientific question but a philosophical one, and it demands discarding how we've been thinking about our lives and their meaning for thousands of years. Dutton, 2016, 470 pp., $28.




**GETTING RISK RIGHT: Understanding the Science of Elusive Health Risks.** Geoffrey C. Kabat. Understanding risk is an important part of skepticism, especially regarding medical issues (What's the real risk of HPV vaccines, immunizations, and cell phones, for example?). Kabat, a cancer epidemiologist, helps readers understand relative versus absolute risk, medical research, how pseudoscientific and questionable claims get (mis)reported by news media and activists, and much more. Includes a glossary and extensive notes. Columbia University Press, 2016, 272 pp, $35.

scientist first and points out that many philosophers of science have no experience in actually working as scientists. He writes, "From the start I sought philosophical ideas capable of clarifying the philosophical issues that science seemed to generate" (104).

He has applied his intellectual skills to a wide array of subjects, including causality, the mind-body problem, economic development, psychology and sociology, cybernetics, ethics, politics, and law. Throughout his career, he has been obsessed with exploring the relations between "philosophy and the sciences of life, mind, and society as well as the study of values" (277). He considers his main contribution to physics to have been his book *Foundations of Physics* (1967), which has a strong philosophical underpinning. In it, he set out to prove that quantum and relativistic theories are observer-free and that their subjectivist, observer-centered interpretations are "illegitimate philosophical grafts."

The "two worlds" in the title of his memoirs might refer to his life in Argentina and his life in Canada, but in his preface, he hints that there are *four* worlds, presumably pointing to his careers as both a physicist and a philosopher. By my count, there are even more. Consider for example his writings on psychology, biology, and neuroscience. And then there is his political/social world and the continuing importance he has placed on the study of values, ethics, and society throughout his career.

### Jousting with the Great and the Near-Great

His life, both personal and academic, has been peppered with interactions with members of the world's academic elite, Nobel laureates amongst them. True to form, he has never hesitated to be forthright expressing his views when in disagreement with any of them. For example, he argued with Karl Popper, flatly rejecting his assertion that theories must be falsifiable. He writes that the notion that

> scientists ought to seek to falsify their pet theories, instead of trying to confirm them, is at once psychologically and methodologically false. Indeed, only masochists behave that way; disconfirmation is not more reliable than confirmation, and the only true indicator we know and rely on is confirmation together with compatibility with extant knowledge. (384)

Further, he rejected as pseudoscientific what he saw as Richard Dawkins's genetic determinism (that development and evolution are mutually independent), and he challenged the validity of what he referred to as Daniel Dennett's "fantasy of evolutionary algorithms." While admiring some of Stephen Jay Gould's contributions, he also expressed significant criticism, which, he was later informed, led Gould to change his mind about Bunge's standing as a philosopher, demoting him from the top of his totem pole to the bottom.

### Bunge the Skeptic

Staunch opposition to pseudoscience has been a constant factor throughout Bunge's academic career, and he points out that he was one of the few senior philosophers to participate in the so-called "science wars" when postmodernism began its march across university campuses. He strongly criticized constructivist

relativists and attacked the notions that "science is politics by other means" and that scientific controversies are about power, not truth.

His skepticism took root early in his life. At age eighteen, he wrote a small book, *Marx vs. Freud*, a critical rejection of psychoanalysis, but he never attempted to publish it. While his fierce criticism of psychoanalysis as pseudoscience has continued throughout his life, he has repeatedly targeted pseudosciences in general, "because they are at best false; because they divert public attention from important issues and discipline; because they undermine trust in scientific research; and because some of them may be used to prop up socioeconomic privilege."

However, he points out that belief in such things as telepathy and horoscopes is relatively harmless, compared to

> belief in nativism, in standard economic theory, in liberty without equality, and in inequality without liberty, [that] have been even more pernicious than the so-called alternative medicines, because they have struck entire peoples. Regrettably, most skeptics have overlooked the crucial difference between harmless and harmful pseudoscience, and have confined their attention to the oldest and less dangerous superstitions, like astrology and alchemy, perhaps because they are easier to criticize. (277)

He urges skeptics to embrace methodological rather than absolute skepticism, if only because every criticism is relative to some body of knowledge. Methodological skeptics, he tells us, doubt only the insufficiently substantiated claims, reject the groundless ones, and suspend belief in untested propositions.

### What the Telling Tells Us about Mario Bunge

The telling in this case reveals a man of exceedingly high confidence who has lived his life guided by strong principles about truth, science, and justice. His passion for fairness and equality no doubt reflects at least in part being reared in a fascist society by a family that eschewed fascism. From an early age, he took risks to fight against repression and to express his values and speak his truths.

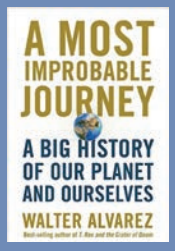
As noted above, he has not backed away from expressing his disdain for faulty reasoning, no matter how celebrated the reasoner. His impatience with muddy thinking is evident throughout the book, and he clearly does not suffer fools gladly.

And the telling also demonstrates the importance of his family in his life. The book is filled with references to family members and includes over thirty pages of historical family photographs. In an appendix, his wife, Martha, writes about what it is like to be married to Mario Bunge.

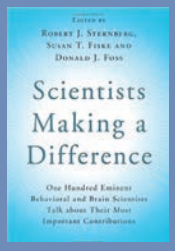
### Conclusion

*Two Worlds* is a highly readable account of the life and times of a distinguished scholar, a remarkable man whose intellectual curiosity and determination could not be dampened by the overwhelming repressiveness of the fascist Perónist regime. Kudos to Mario Bunge for memoirs well-written and for a life, both personal and academic, still being well-lived at ninety-seven. ■

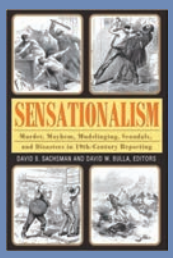
**THE MADHOUSE EFFECT: How Climate Change Denial Is Threatening Our Planet, Destroying Our Politics, and Driving Us Crazy.** Michael E. Mann and Tom Toles. When a distinguished climate scientist and a noted political cartoonist get together, watch out! This lively collaboration has produced a short, readable, entertaining, visually appealing book about the "madhouse atmosphere" in which scientific evidence documenting our changing climate amasses yet the political opposition to that data continues to flourish in its own parallel universe. Both the scientist and the cartoonist are passionate and effective in communicating the problem's urgency. Columbia University Press, 2016, 186 pp., $24.95.




**A MOST IMPROBABLE JOURNEY: A Big History of Our Planet and Ourselves.** Walter Alvarez. To a historical scientist like famed geologist Walter Alvarez (UC Berkeley, author of *T. Rex and the Crater of Doom*), books about even "world history" are restricted in time and space. The "Big History" movement, of which Alvarez is an advocate, integrates traditional historical scholarship with scientific insights to study the full sweep of the universe and its past. He thinks of this panoramic viewpoint as combining four regimes—Cosmos, Earth, Life, and Humanity. Here in just a couple hundred pages, he seeks to make the first three (all "prehuman" history) accessible and comprehensible, no matter whether your background is in the humanities or science. W.W. Norton, 2016, 246 pp., $26.95.




**SCIENTISTS MAKING A DIFFERENCE: One Hundred Eminent Behavioral and Brain Scientists Talk about Their Most Important Contributions.** Edited by Robert J. Sternberg, Susan T. Fiske, and Donald J. Foss. The subtitle of this book says it all; surveying a broad range of disciples (social cognition, happiness, autism, social modeling, creativity, memory, and much more), 100 researchers talk about their work and why it matters—not only to them but to the world. Contributors span the spectrum, from Elizabeth Loftus to Albert Bandura and Daniel Kahneman, and often offer personal glimpses into the personalities and processes that formed (and informed) some of our best-known ideas in cognitive research. Cambridge University Press, 2016, 512 pp, $34.99.



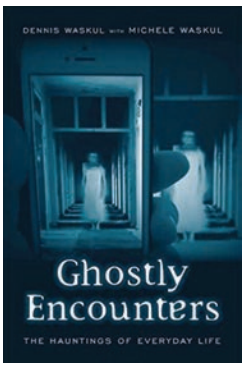

**SENSATIONALISM: Murder, Mayhem, Mudslinging, Scandals, and Disasters in 19th-Century Reporting.** David Sachsman and David Bulla, editors. Sachsman and Bulla have gathered a colorful collection of essays exploring sensationalism in nineteenth-century newspaper reporting. The contributors analyze the role of sensationalism and tell the story of both the rise of the penny press in the 1830s and the careers of specific editors and reporters who contributed to that style. The book is divided into four sections. The first is titled "The Many Faces of Sensationalism," providing a defense of yellow journalism, analyzing the place of sensational pictures, and giving a detailed examination of the changes in reporting over a twenty-year span. Though ostensibly a book about journalism, there is much of interest to skeptics since paranormal phenomena is invariably sensationalized in the news media, from *The Exorcist* book and film in the 1970s to *Ghost Hunters* cable TV shows still on the air. The third section, "Murder, Mayhem, Stunts, Hoaxes, and Disasters"—which includes chapters on the 1835 Moon hoax and other bogus news stories widely taken as true at the time—may be of particular use to skeptical researchers. Transaction Publishers, 2015, 391 pp, $34.95.

**UFO FAQ: All That's Left to Know about Roswell, Aliens, Whirling Discs, and Flying Saucers.** David J. Hogan. A new attempt at an all-inclusive guide to UFO lore—hard science and hoaxes, sightings and claimed abductions, research and supposed cover-ups. Hogan, an Illinois book publisher, is comprehensive in his approach. While he is not overtly skeptical and the book seems short on critiques, he does attempt to be rational and, despite his admitted enthusiasm of the topic, reasonably objective. He opens with a section of short bios of members of the UFO community, proponents and skeptics, past and present. Backbeat Books, 2016, 407 pp., $19.99.

*—Kendrick Frazier and Benjamin Radford*

# What Ghosts Mean

BENJAMIN RADFORD




***Ghostly Encounters: The Hauntings of Everyday Life.*** By Dennis and Michele Waskul. Temple University Press, 2016. 184 pp. Paperback, $25.95.

*Ghostly Encounters* is the product of two years of fieldwork and interviews with more than seventy Midwestern Americans by Dennis Waskul (a professor of sociology at Minnesota State University Mankato and author or coauthor of several books) and Michele Waskul (an independent scholar with a focus on special education). The authors examine how people experience ghosts and hauntings in everyday life through an ethnographic lens, including how uncanny happenings become ghosts and why people struggle with belief or disbelief.

They found that "many participants in this study were not sure that they had encountered a ghost and remained uncertain that such phenomena were even possible, simply because they did not *see* something that approximated the conventional *image* of a 'ghost.' Instead, many of our respondents were simply convinced that they had experienced something uncanny—something inexplicable, extraordinary, mysterious, or eerie" (p. 20). Thus we see why defining and explaining ghostly phenomenon is slippery and problematic. Many people who will go on record as having a ghostly *experience* didn't necessarily see anything that most people would recognize as a classic "ghost," and in fact they may have had completely different experiences whose only common factor is that they could not be readily explained. As I describe in my book *Scientific Paranormal Investigation*, context is critically important to understanding the claims: something "unknown" or "unexplained" in the context of a reputedly haunted house will be interpreted as a ghost, while something "unknown" or "unexplained" in the context of a wilderness hike may be interpreted as a Bigfoot; in the context of something odd in the skies, it may be explained as a UFO.

The Waskuls note that "given all their otherworldly powers to defy the known laws of nature, the majority of everyday ghosts are dramaturgically impaired. Ghosts are most often indifferent to the living. When ghosts bother to pay us any attention at all, that attention is more frequently friendly and even helpful than malevolent" (p. 10). Indeed, apparently odd, peculiar, or strange things happen in our everyday lives—and usually pass unnoticed. "When something odd occurs, we either ignore or investigate. If we choose to investigate, most times we find an answer, and sometimes we do not, but either way we minded it. Oftentimes, if an answer is not found and the oddity is mundane enough, it is easy to just scratch your head and move on with your business" (p. 3).

When afraid, alarmed, or psychologically primed to the idea that something unusual and unknown is going on, our sensitivity to anything odd or out of the ordinary goes up, and things that we would otherwise ignore (or perhaps not even notice) can take on added significance. Common occurrences such as flickering lights, dead batteries, unexplained but fleeting unease, computer crashes, blurry sections in photographs, video glitches, and so on can be, and have been, claimed as possible evidence for ghosts. Not only does this unconscious psychological bias lead us to pay attention to such mundane mysteries, but it also imbues them with added significance, making them much easier to remember. A flashlight that happens to go out during a power failure will be soon forgotten, but a flashlight that happens to go out in a dramatic moment when a ghost hunter is asking for a sign from an invisible spirit will be remembered for a lifetime.

The book's approach is less investigative or skeptical than perhaps many readers of this publication would like. *Ghostly Encounters* contains many first-person anecdotes about ghostly experiences (some of them quite lengthy), and little or no effort is made to establish the truth or validity of such claims. In this sense the Waskuls' ethnographic research is aligned with a folkloric approach. Ghost stories, whether presented as fictional campfire tales or "true" stories are a dime a dozen—as anyone who's visited a library or bookstore knows. *Ghostly Encounters* helps explain what ghosts mean, not only to ghost experiencers but also more broadly in society. The book is a bit self-indulgent, with several extensive digressions about the authors' personal opinions and beliefs about the spirit world, though as Dennis Waskul wryly notes, "I have to admit that I've come to envy the people who reported having poltergeists in their home; they have a ready explanation for anything amiss in their household" (p. 134).

**When afraid, alarmed, or psychologically primed to the idea that something unusual and unknown is going on, our sensitivity to anything odd or out of the ordinary goes up, and things that we would otherwise ignore (or perhaps not even notice) can take on added significance.**

The book is divided into five chapters, with such titles as "Ghostly Reason," "Ghostly Topology," and "Ghostly Legends," and presents an assortment of scholarly curiosities (in case you've wondered why most ghosts are assumed to be men, the Waskuls speculate about this on pages 87 and 88). In their chapter on "Ghostly Reason," the Waskuls claim that "in the process of doubting what is real, people routinely rely on an approximated scientific method to make empirical observations, formulate inferences, identify correlations, arrive at working hypotheses, and sometimes test these hypotheses" (p. 45). As someone who has interviewed hundreds of alleged ghost experiencers (as well as worked with many amateur ghost hunters), I think the Waskuls greatly overestimate the average person's understanding of scientific methodologies. I agree that most ghost experiencers exhibit a modicum of skepticism, don't automatically assume that everything odd is a ghost, and may make some effort to "test" their interpretations, but suggesting that they "approximate scientific methods" is only true if one uses *approximate* very broadly. In describing how one woman, Amy, tried to "test" her idea that a ghost was present, the Waskuls admit that "Amy's test would not pass 'a double-blind test in laboratory conditions,' but they work for *her*" (emphasis in original). But of course that's not how science operates. Science does not "work" for some people but not others. Subjectively validated science is no science at all, and it would be more accurate to say that people attempt to "test" their perceptions than that they do so in a way resembling a scientific process.

There are many excellent books on ghosts from a variety of scholarly perspectives, including historical (for example, R.C. Finucane's *Ghosts: Appearances of the Dead and Cultural Transformation*); folkloric (*Alas, Poor Ghost! Tradition of Belief in Story and Discourse*, by Gillian Bennett); and sociological (*The Haunted: A Social History of Ghosts*, by Owen Davies). *Ghostly Encounters* is an interesting contribution to the literature on what ghosts mean to the individuals who experience and report them. ■

Benjamin Radford is deputy editor of the Skeptical Inquirer and a frequent scientific investigator of ghost claims. His books include *Scientific Paranormal Investigation: How to Solve Unexplained Mysteries* and *Mysterious New Mexico: Miracles, Magic, and Monsters in the Land of Enchantment*.

## Nuclear Power and Risk Psychology

In his excellent article on nuclear power ("Nuclear Power and the Psychology of Evaluating Risk," November/December 2016), Daniel Vogel compares nuclear power to a hypothetical perfect alternative that is completely risk free. In spite of doing so, he makes an excellent case for why nuclear power is not the dirty and dangerous energy source it is made out to be.

How does nuclear power stack up to a real alternative such as coal? Coal miners are subject to black lung disease. Their deaths are every bit as horrible as what people imagine dying from radiation poisoning would be like. And coal mining has despoiled vast tracts of land in the "coal country" parts of West Virginia and Kentucky. But what about the storage of radioactive materials? The mining and burning of coal concentrates chemical toxins like arsenic and mercury. After ten thousand years, almost all the radioactivity in nuclear waste has cooked off. After ten thousand years, all of the toxicity of the arsenic, mercury, and the many other toxins in the tailings produced by the mining and burning of coal remains. Coal is the worst, but there are problems with all of the alternatives. The question should not be the one that is usually asked, namely "Are there problems with nuclear?" but instead, "Are the problems with nuclear greater or less than those of the alternatives?"

And finally a word about nuclear accidents. No one was killed at Three Mile Island, unlike at coal mine disasters too numerous to count. The Fukushima plant was obsolete and should have been replaced with a newer design that would have sailed through the tsunami, even though it was of unprecedented size. But misinformation and intransigence by antinuclear forces make it impossible to do so. And the reactor design used at Chernobyl was known to be extremely dangerous and should never have been used.

Patrick J. Russell
Seattle, Washington

I think Vogel's excellent article overlooks one significant dimension to the nuclear power issue, best illustrated with an example. I am well aware of the remarkable safety record the airline industry has achieved in terms of passenger miles traveled. Nonetheless, I prefer to drive from here to there because I "feel safer." The reason is simple: driving my car gives me the illusion of controlling my own fate. I can react to and avoid danger; my fate is in *my* hands. Not so with air travel: if something goes wrong, I am helpless; my fate is sealed by the action or inaction of the pilots or the aircraft's manufacturer or other forces outside my control.

Thus perhaps with many opponents of nuclear power. The statistical safety record of the industry is remarkable. But to many it represents the loss of (illusory) power to determine their own fate. Should an accident occur (never mind how vanishingly likely), they would be, so to speak, trapped in a crashing airplane, unable to do anything to save themselves.

All this clearly defies rational analysis. Many who are uncomfortable flying are perfectly happy to ride in a friend's car, despite having no control over the driver's actions. Failures of hydroelectric and other conventional power plants have claimed many more lives than failures of nuclear power plants—but fire and flood are familiar phenomena from which escape seems straightforward. One feels in control of one's own fate in even those circumstances.

Not so with nuclear power. The fear of losing control of one's fate—arising perhaps from both unfamiliarity and, as Vogel points out, "the psychological effect" of the word *radioactive*—strikes me as a root cause of opposition to it.

And despite Vogel's first-rate article, I don't think such fear can be successfully addressed by a peppering of statistics. As to how it *can* be addressed . . . well, there's a challenge for the clinical psychologists!

Tom Gordon
Cedar City, Utah

Your article on the issue of nuclear power generation could not have been written better if it had been done by a professional nuclear industry consultant. It belittles concerns and avoids inconvenient, substantive issues such as: the poor safety history of commercial nuclear power plants; the lack of any long-term storage facility for radioactive waste; the dangers associated with catastrophic failure; and how to deal with the huge volume of material remaining when a nuclear plant is eventually decommissioned.

The article is in no way an examination in a scientific or rigorous manner. Given the poor editorial oversight inclusion of this article indicates, I see no reason to continue my subscription to this publication.

James Herndon
Seattle, Washington

The Vogel article appears to be correct as far as it goes but neglects one very important feature that most of us who strongly oppose nuclear power consider tantamount—nuclear waste! Until that problem is addressed you cannot say that nuclear is a non-polluting source of energy. The longevity of the danger of the waste, plus the huge up-front costs, leave most of us wondering why you continue to consider this option when alternatives and conservation show such promise.

William Kuchler
Barneveld, New York

I was disappointed in reading your article and finding no evaluation whatsoever of the risk of disposing of nuclear waste.

Does the author propose to dispose of it at the bottom of the ocean or perhaps in deep, deep wells or perhaps somewhere in the Arctic or Antarctic?

It seems to me that with the half-lives of some of the waste in almost unbelievable long periods of time, the author should have addressed this problem at length.

Doug Jackson
Knoxville, Tennessee

*Daniel Vogel replies:*

*Thank you to all who responded. Let me reply in particular to the three readers who raised understandable (and real) concerns about waste. All references by physicists that I have examined agree there are risks to nuclear energy but simply state they are very low compared with those of other forms of energy.*

*I did stress the integral fast reactor in particular as it produces less waste and can be fueled on the waste of existing more wasteful reactors, in essence potentially removing the world of its nuclear waste while generating our electricity and not contributing to global warming (see the book* Plentiful Energy *by Till, which discusses its physics in great detail).*

*It interests me psychologically that a form of energy that does not contribute to global warming tends to be the most criticized by mostly left-leaning citizens (which is why a bias was hypothesized here) despite the fact that its risk (which no scientist is denying) is hugely lower than that of petroleum and coal, and may be the lowest risk of them all. I just entered a Google search for deaths in various industries and came across an interesting chart (http://motherboard.vice.com/blog/whats-the-deadliest-power-source—yes, nuclear had the least).*

*To eradicate climate warming as soon as possible, should we not personally in the Western-Northern world (who have contributed the most to it) be the first to ac-*

*cept whatever low risks of nuclear there may be, given that it will be the Eastern-Southern and poorer world that will suffer the most? We should all study the statistics on these comparative risks (including nuclear waste storage) and, in a rational world (which admittedly it isn't) support those solutions with the least risk for the highest energy yields (assuming our letter writers want to go on with energy-hungry laptops and cell phones).*

*It seems to me that a valid question would be: What will be the risk of political biases causing non-action through silencing one of the most effective science-driven solutions to this catastrophic problem? (And of course, as is true in science, heated debate goes on until hopefully the evidence brings us to a consensus of some sort.)*

## Odysseys in Skepticism

I was so pleased to read Harriet Hall's "My Personal Odyssey in Skepticism" (November/December 2016) because, to me, she is one of the luminaries of skepticism that I look up to.

I want to add to her report my observation of the lack of sexism and the equal treatment I have experienced or observed in the skeptic movement. Skeptics have been very welcoming, warm, and patient with me, a nonscientist. The fact that skeptics were willing to question whether there is sexism or unfairness in the movement shows the fine characters who are in the movement. As a skeptic, I'm glad there was nothing to find when they looked for sexism in skepticism. Keep up the good work.

Trish Randall
Vancouver, Washington

I read the eight essays in the November/December issue ("Odysseys in Scientific Skepticism") and could not help but notice that four of the eight came from skeptics living outside the United States. While I welcome hearing of skeptical activities around the world, I asked myself "Couldn't more of the essayists have been recruited from skeptics within the United States?"

Then I noted an observation made in several of the essays that true believers of many fringe beliefs will maintain their beliefs despite all facts and rational evidence to the contrary.

Then I recalled the U.S. election results. While despairing that despite forty years of active skepticism as documented in the pages of the issue (as well as all the past issues), I had to conclude that perhaps many U.S. skeptics had decided to keep a low profile at this time.

I only hope that all skeptics will renew their efforts to promote rationality and that the Skeptical Inquirer will carry on.

James Cooper
Benton City, Washington

*Editor Kendrick Frazier replies:*

*Several points: 1) Skepticism, like science, knows no national boundaries; 2) SI is an international magazine; 3) in our first of the two anniversary issues (September/October 2016), eight of the eleven essayists were from the United States. Finally, I've never known skeptics to keep a low profile; we will definitely carry on!*

I read with interest Benjamin Radford's essay "Skepticism's Big Tent" (November/December 2016). I have to confess that I'm skeptical about his claim that "anyone with a willingness to learn and share is welcomed."

I am an Episcopal priest who reads your magazine and newsletters because I think it's important to keep an open mind and remain in dialog with everyone, especially those whose opinions might differ from mine on important topics. If I came to a meeting, would I really be welcomed with open arms and given a task, per Radford's claim that there's no "occupation or hobby that doesn't have some angle into pseudoscience or paranormal claims"? Or would I be scoffed at and told to run away and play with my superstitions? I would hope it would be the first—after all, who better to pursue bogus religious claims than someone with the inside angle?—but given what I've seen professed in many articles and letters in your magazine, I have to say I suspect it would be the latter.

I am truly happy to talk with people of every faith and no faith because I think I have something to learn. Are you really willing to extend the same courtesy to me?

Sharon Sheffield
Long Beach, California

*Benjamin Radford replies:*

*I appreciate your writing, as you raise an important question: "If I came to a [skeptics] meeting, would I really be welcomed with open arms and given a task" or scoffed at and dismissed? I of course can't speak for all skeptics (it's a big tent, after all, with a wide variety of people and positions, ranging from welcoming to cantankerous), but I think you might be surprised.*

*I have had many fascinating and fruitful discussions and collaborations with believers of all types, from ghost hunters and dowsers to people who sincerely believe they are psychic, to religious folks who attribute good and surprising rescues and seemingly miraculous events to divine intervention. My goal is to investigate, to understand as best I can what happened and why. Being mocking or hostile to, or dismissive of, eyewitnesses and believers is not only unnecessary but counterproductive and disrespectful.*

*Some skeptics are strident, while others are happy to engage respectfully; we are as varied as any other group. If you haven't seen it, you may be interested in reading a piece I wrote a few years ago in which I discussed what I had in common with a Canadian Archdeacon (see http://tinyurl.com/zfyg36c).*

*I find that people are far more alike than different, and that finding common ground is far better than finding reasons to disagree. I'd be happy to work with you on any projects, articles, or ideas that would help encourage skepticism and critical thinking. (Editor's Note: Radford did not receive a response to his offer.)*

## Contrails and 'Chemtrails'

Kendrick Frazier's story about chemtrails in the November/December 2016 issue led me to read the referenced document at www.iopscience.iop.org. While the arguments against the chemtrail conspiracy are based in science, the history of contrails encountered on high-altitude bombing forays in WWII wasn't even mentioned in this scientific study. One of the pictures in the Wikipedia article on contrails shows a number generated by B-17s over Europe in 1944. It was common to see them in the newsreels of the time before the days of TV news.

Perry Crabill
Winchester, Virginia

## [FEEDBACK

The letters column is a forum on matters raised in previous issues. **Letters should be no longer than 225 words**. Due to the volume of letters we receive, not all can be published. Send letters as email text (not attachments) to letters@csicop.org. In the subject line, provide your surname and informative identification, e.g.: "Smith Letter on Jones evolution article." Include your name and address at the end of the letter. You may also mail your letter to the editor to 944 Deer Dr. NE, Albuquerque, NM 87122.

Astounding Tales of Science!
Greg Thelen & Celestia Ward
PROFESSOR SCIENCE TACKLES...
PATENTLY ABSURD PATENTS
HELLO SCIENCE FANS! HAVE YOU EVER HAD SOMEONE SHOW YOU A PATENT ONLINE AND CLAIM IT WAS ABSOLUTE PROOF OF SOME NEFARIOUS CONSPIRACY ABOUT CHEMTRAILS, FREE ENERGY MACHINES, OR CORPORATE SUPRESSION?
LET'S TAKE A LOOK AT SOME PATENTS, AND THINK ABOUT WHAT, IF ANYTHING, THEY "PROVE."
PATENTS ARE MENTIONED IN ARTICLE 1, SECTION 8, CLAUSE 8 OF THE U.S. CONSTITUTION:
"The congress shall have the power...to promote the progress of science and the useful arts by securing for limited times to authors and inventors the exclusive rights to their respective writing and discoveries."
LIKE ALL CONSTITUTIONAL CLAUSES, THE PATENT CLAUSE IS OPEN TO INTERPRETATION...
useful
...AND THE U.S. PATENT OFFICE INTERPRETS IT'S JOB AS ASSESSING THE UTILITY OF A PATENT, NOT THE TRUTHFULNESS OF EVERYTHING STATED THEREIN.
IN FACT, PATENT EXAMINERS ARE INSTRUCTED* TO PRESUME TRUTH... BASICALLY THE OPPOSITE OF SCIENTIFIC METHOD AND PEER REVIEWED JOURNALS, WHICH AIM TO SCRUTINIZE, VERIFY, OR DISPROVE.
IT'S NOT HARD TO SEE WHICH CARRIES MORE WEIGHT...
PATENT OFFICE
PEER REVIEW
*"Office personnel are reminded that they must treat as true a statement of fact made by an applicant . . . it is improper to disregard the opinion solely because of a disagreement over the significance or meaning of the facts offered."
"Repeatable results or GTFO" (paraphrased).
THIS LOW BAR DOES TEND TO ATTRACT A FEW CRANKS WHO SEEK APPROVAL OF THEIR UNIQUE "THEORIES"—APPROVAL THEY CANNOT GET THROUGH REGULAR SCIENTIFIC CHANNELS.
EXCELSIOR!
INFINITY GAUNTLET APPROVED
BELIEVE
LET'S TAKE A LOOK AT SOME FUN EXAMPLES OF PATENTS BASED ON NONSENSE...
...LIKE U.S. PATENT 5058833.
THIS PATENT CLAIMS THE DEVICE WILL "HARNESS RADIATION IN INTERSTELLAR FLIGHTS"...BUT IT'S BASICALLY A PROPELLER ON A ROTATING SHAFT. ADD A RUBBER BAND AND THIS THING MIGHT BE ABLE TO FLY THE DISTANCE OF YOUR BACK YARD.
...THE PATENT CLAIMS WE SHOULD "BE SKEPTICAL" OF INTERSTELLAR DISTANCES BECAUSE SCIENTISTS ARE "CONFUSED" ABOUT THE SPEED OF LIGHT...TRULY GROUNDBREAKING NOTIONS WORTHY OF A FEW NOBEL PRIZES, IF ANY OF IT WERE TRUE.
THEN WE HAVE U.S. PATENT 4666425... A DEVICE TO KEEP A DISEMBODIED HEAD ALIVE...
IT'S BASICALLY SOME TUBES AND WIRES.
BIOLOGY WOULD BE—AHEM—TURNED ON ITS HEAD IF THIS THING ACTUALLY WORKED.
REMEMBER, PATENT AGENTS ARE HUMAN BEINGS. ON A ROUGH DAY, AN OVERWORKED AGENT MIGHT JUST GIVE IN TO A PERSISTENT "INVENTOR" AND ISSUE AN ABSURD PATENT RATHER THAN ARGUE AGAINST A DEVICE'S VIABILITY.
...SO UNLESS YOU ARE WILLING TO ACCEPT THE NOTION OF A REALITY WHERE DISEMBODIED HEADS TRAVEL AROUND SPACE WITH THEIR PATENTED PROPELLOR BEANIES...
HI FRED! I'D WAVE TO YOU BUT I'M A DISEMBODIED HEAD!
...DON'T ACCEPT A PATENT AS "PROOF" OF ANYTHING.
www.ProfessorScienceComic.com
(TIP O' THE PEN TO AARON WARD, J.D.)

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